

August 18, 1958

**Soviets Report
Space Details**

**CAA Forecasts
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Aviation Week

Including Space Technology

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Vertol 76 Turboprop VTOL



requires no wrench clearance...

IT'S THE "LITTLEST" SELF-LOCKING NUT......IN THE WORLD!

Another "first" by Kaynor—originator of every major improvement in self-locking nuts in the last 20 years!

We eliminated conventional hex nut wrenching surfaces to give you the Kaylock H50, a two-point serrated self-locking nut that enables you to reduce your present space dimensions as much as one-third! H50 self-locking nuts are installed by wrenching on the threaded nut element itself with standard spin type or socket wrenches 3 to 4 sizes smaller than required by standard hex nuts.

And because the wrench never touches the mounting surface, troublesome scratching and damage is eliminated. Your Kaylock consultant can point out limitless applications in which the H50 offers definite advantages.

Available in flared sizes: 1/4-20 to 3/4-16 and 8-32

KAYLOCK.

all-metal self-locking nuts



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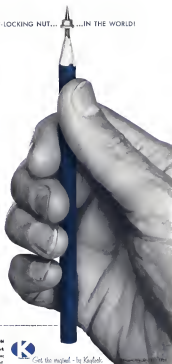
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ANSWER TO THE PROBLEM OF RE-ENTRY:

Now Come of Very Special Material—
engineered by Goodyear Aircraft

To encounter a ballistic missile calls for engineering ingenuity to solve the re-entry problem.

Shown here is a special nose cone fabricated of a classified material developed through the teamwork of the Army Ballistic Missile Agency and the engineering skill of Goodyear Aircraft Corporation.

Result: the Army's Jupiter— and other ballistic missiles of the future—will look to Goodyear built nose cones to bear the brunt of red hot re-entry into the earth's atmosphere.

Such performance is the result of applied engineering in which Goodyear Aircraft has been a standard for many years. These skills are backed by huge manufacturing facilities including mammoth presses to mass-produce this product.

Let these skills solve your special problems. Write, today and now, to Goodyear Aircraft Corporation.

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GOODYEAR AIRCRAFT

Plants in Akron, Ohio, and Lockford Park, Arizona

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POPULATION 30,000



NEWEST ADDITION TO RAYTHEON "CITY"

*Increases
company's
engineering space
to 903,000 sq. ft.*

Raytheon's brand new laboratory at Santa Barbara, California, is devoted to advanced engineering in radar, communications, electronic systems related. This is another extension of Raytheon "City"—the locus of electronics companies that has grown from Massachusetts to Tennessee to California.

Here are the company's vital statistics:
POPULATION: 3,000 scientists and engineers (31,000 employees in all)
BUILDINGS: 26 plants and laboratories.
WORK AREA: 903,000 square feet of engineering space; 4,194,821 square feet of total space.
ACTIVITIES VITAL TO NATIONAL DEFENSE: Missiles—Navy Sparrow III and Army Hawk; bombing radar for the D-19; DEW line radar, tubes, transmitters, magnetrons, amplifiers. Myriston and backward wave oscillators.
REPUTATION: World-wide.



Centuries in Electronics

RAYTHEON MANUFACTURING COMPANY
Waltham, Massachusetts

AVIATION CALENDAR

- Aug. 25-27—Third Annual Conference, National Flying Club, Inc., Hollywood Roosevelt Hotel, Hollywood, Calif.
- Aug. 29—Second Symposium on Naval Ordnance, Washington, D. C.
- Aug. 25-28-1955 Texas and Southwestern Society Convention, Grand Prairie, Tex.
- Aug. 30-Sept. 1—United One Design Sailplane Regatta, Haver Hill, Elmore, N. Y.
- Aug. 31-Sept. 1—Air Race, Professional Race Club, Inc., 25 Walnut, 1st Fl., Philadelphia, Dist. Building 15 Hudson Ave., Akron, Ohio.
- Sept. 1-7-1955 Farnborough Flying Display and Exhibition, Society of British Air and Astronautics, Farnborough, Eng.
- Sept. 2-12—Falloosh, of High Powerful Radar Design Summer Program, Motorola and Institute of Technology, Cambridge, Mass. (Security clearance required).
- Sept. 3-8-1955 Congress Engineering Civil Institute, Massachusetts Institute of Technology, Cambridge, Cambridge, Eng. land.
- Sept. 4-15—First International Congress of the Astronomical Sciences, Palace Hotel, Madrid, Spain.
- Sept. 5-8—Second National Conference on Applied Meteorology, Engineering Air Mater, New Program Chairman Dr. D. J. Peterson, 1900 East Expressing Bldg., University of Michigan, Ann Arbor, Mich.
- Sept. 10-12—Annual Business Meeting and Conference, Northeast Chapter American Association of Airport Engineers, Mansfield Airport, Waverlet, Mass.
- Sept. 15-18—Fall Meeting, American Rocket Society, Inc., Hotel Statler, Detroit.
- Sept. 15-16—Annual Instrumentation Technician Conference & Exhibit (International) in (Continued on page 6)

AVIATION WEEK Including Space Technology

August 16, 1956
Vol. 47, No. 7

Continued study with an additional page in September. The 1956-57 edition of the Aviation Week Yearbook is a comprehensive guide to the aviation industry. It contains information on the latest developments in aircraft, space, and related fields. The Yearbook is published by Aviation Week Inc., 1230 Avenue of the Americas, New York 20, N.Y.

Subscription rates: \$10.00 per year in advance. Single copies: \$3.00. Write for details to Aviation Week Inc., 1230 Avenue of the Americas, New York 20, N.Y.

Editorial, News and News 1230 in Aviation Week, 1230 Avenue of the Americas, New York 20, N.Y.

AVIATION WEEK, August 14, 1956

Progress in the Science of Chronometry



In 1714, the British government offered a prize of £20,000 for any means of determining a ship's longitude within 30 nautical miles at the end of a six week's voyage. John Harrison, a self-educated Yorkshire carpenter, won the prize in 1760 with an accurate clock.



In 1958, ICBMs and earth satellites created the need for new concepts in accurate timing. To fill this need, Hycon Eastern has developed an electronic Timing System with barocyclic unattainable timing precision capable of operating anywhere in the world.

AN INTEGRATED TIMING SYSTEM FOR TODAY'S GLOBAL CONCEPTS



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Solar or sidereal time is displayed visually and is available for input to automatic computers and indexing data with many types of recorders . . . magnetic tape, oscillograms, photographs and strip charts. Furnishing a time scale with resolutions available to one microsecond, this system is ideally suited for tracking and control of missiles, astronomical measurements, and navigation systems. Write for Bulletin TS-00.



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TELEMETERING GROUND STATIONS

Bendix-Pacific FM-FM Receiving Stations have achieved a new high in operational simplicity. Compact, rugged, highly reliable components and advanced calibration techniques combine to produce exact channel selection and calibration switches. With Bendix-Pacific stations, high accuracy data can be obtained in a shorter time than ever before.

Bendix-Pacific Receiving Station Systems represent the most advanced state of the art. Two types are available. The **TP65-100 Receiving Station** is designed for either real time reception and demodulation of signals from FM-FM Telemetry Transmitter Systems or demodulation of tape recorded data. The **TP65-600 Receiving Station** is designed primarily for precision reproduction of tape recorded information from FM to analog.

Bendix-Pacific maintains a complete staff of engineers and personnel to assist you in the solution of your data problems. Contact —

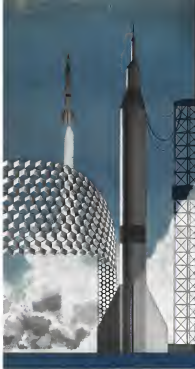


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Chicago: Distribution Company of Chicago, Chicago 4, Illinois
East: Western Electric International, 265 E. 42nd Street, New York 17, New York

AVIATION CALENDAR

(Continued from page 9)

- moment Society of Aeronautics, Philadelphia, Pa.
- Sept. 22-24-1958. National Telemetering Group on Telemetering and Remote Control, Lincoln Hall, 101 North Main Street, Philadelphia, Pa.
- Sept. 22-24-Soviet Union Meeting, Standard Engineers Society, Benjamin Franklin Hall, Philadelphia, Pa.
- Sept. 25-27-1958. Annual National West and Texas Aeronautics Helicopter Society, Ambassador Hotel, Los Angeles, Calif.
- Sept. 25-26-San Francisco Area Aeronautics and Space Engineers, Pasadena, Dallas.
- Sept. 26-28-2-11th Annual Electrochemical Society, Chicago, Kansas City, Mo., Omaha.
- Sept. 27-29-1-National Aeronautical Meeting, Society of Automotive Engineers Inc., The Ambassador, Los Angeles.
- Sept. 29-Oct. 1-San Antonio Meeting and Western Test Show, American Society of Test Engineers, Sheraton Exposition Hall, Los Angeles, Calif.
- Oct. 1-2-Conference on Radio-Induced Reactions, sponsored by American Research Foundation and U.S. Army Signal Engineering Laboratory, Mission of Science and Industry, Chicago, Ill.
- Oct. 4-5-Metropolitan Airports Conference, University of Oklahoma, Norman, Oklahoma. Sponsored by American Association of Airport Executives and the FAA.
- Oct. 4-5-Soviet Union Aeronautics Research Society of Experimental Test Plans, Sheraton Hilton Hotel, Boulder Hills, Calif.
- Oct. 6-7-National Symposium on Extraterrestrial Energy and Space Transportation, sponsored by Institute of Radio Engineers and Group Washington University, Texas Instruments, Washington, D.C.
- Oct. 6-7-Chicago Space Flight Club's Symposium and Research Society, General Electric, New York, New York, Ohio.
- Oct. 7-8-1958 Joint Meeting, Society of the Aeronautical Sciences and Canadian Aeronautical Institute, Chicago, Illinois, Chicago, Canada.
- Oct. 7-12-58th International Communications Conference, Convention Center, Italy.
- Oct. 8-10-14th Annual Western Space Flight and Guidance Conference, Chicago Space Flight Club, Sheraton Hotel, Chicago.
- Oct. 9-10-14th Annual National Space Vehicle Symposium, sponsored by American Research Foundation, Sheraton Hotel, Chicago, Ill.
- Oct. 11-13-14th Annual National Electronics Conference, Hotel Sherman, Chicago, Ill.
- Oct. 19-21-Toronto Annual Meeting, Semiconductor Association, Niagara Falls, The Plaza South Tower, Plaza South.
- Oct. 20-24-1958. National Vacuum Symposium, Sheraton Hotel, San Francisco, Calif.
- Oct. 21-25-1958 National Simulation Conference, sponsored by Institute of Radio Engineers Professional Group on Electronic Computation, Sheraton Hotel, Dallas, Tex.
- Oct. 27-29-3rd Coast Conference on Aeronautical & Navigational Electronics, in honor of Radio Engineers, Sheraton Hotel, Baltimore, Md.



Steel structures for space ... from Crosley

Today's missiles require materials that are lighter, stronger and more heat resistant. Such requirements make Avco-Crosley a leading contender for building missile frames and structures.

Avco-Crosley is a pioneer in the development of stainless-steel honeycombs, a structural material that is cutting deep into the "aluminum barrier" that so long has hindered the speed at which planes and missiles travel through the air.

Using stainless-steel honeycombs, it is now possible to build structures with great heat tolerance and high strength/weight ratio—with the strength of solid steel, yet weighing only one-third as much.

Together with its associated Avco Division, the Crosley Division now provides facilities and personnel for:

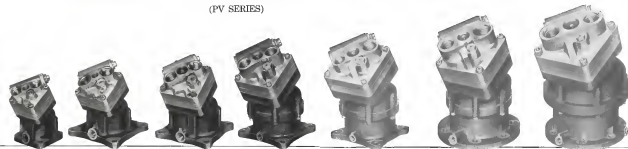
- Weapon system development from initial concept to production
- Research, development and engineering design of missile air frames, air frames, electronics, missile system integration, automatic test and support equipment, ground handling equipment and logistics
- Production and manufacturing for missile and aircraft systems

The more information, write to: Ted Friedman, Director, Product Marketing, Crosley Division, Avco Manufacturing Corporation, Cincinnati 25, Ohio.

Avco // **Crosley**

Design breakthrough now in depth!

VICKERS. ADVANCED DESIGN VARIABLE DISPLACEMENT PUMPS (PV SERIES)



Model Series PV006
Theoretical Dpl. 66 cc/in. rev
Rated Speed 11,500 rpm
Weight 2.4 lb
H x D x L 4.0 x 3.0 x 3.0
Bolt Spacing 3.50"
Overall Length 6.6"

Model Series PV012
Theoretical Dpl. 100 cc/in. rev
Rated Speed 11,500 rpm
Weight 4.7 lb
H x D x L 4.0 x 3.0 x 3.0
Bolt Spacing 3.50"
Overall Length 7.5"

Model Series PV018
Theoretical Dpl. 150 cc/in. rev
Rated Speed 11,500 rpm
Weight 7.0 lb
H x D x L 4.0 x 3.0 x 3.0
Bolt Spacing 3.50"
Overall Length 8.5"

Model Series PV028
Theoretical Dpl. 250 cc/in. rev
Rated Speed 11,500 rpm
Weight 11.0 lb
H x D x L 4.0 x 3.0 x 3.0
Bolt Spacing 3.50"
Overall Length 9.5"

Model Series PV036
Theoretical Dpl. 350 cc/in. rev
Rated Speed 11,500 rpm
Weight 15.0 lb
H x D x L 4.0 x 3.0 x 3.0
Bolt Spacing 3.50"
Overall Length 10.5"

Model Series PV058
Theoretical Dpl. 550 cc/in. rev
Rated Speed 11,500 rpm
Weight 25.0 lb
H x D x L 4.0 x 3.0 x 3.0
Bolt Spacing 3.50"
Overall Length 12.5"

Model Series PV155
Theoretical Dpl. 1,550 cc/in. rev
Rated Speed 11,500 rpm
Weight 100.0 lb
H x D x L 4.0 x 3.0 x 3.0
Bolt Spacing 3.50"
Overall Length 18.5"

*Similar inherent performance advancements phase for the smaller pump sizes. See catalog for these models.

• "Design breakthrough" as used on this page is a carefully considered statement. Here is the lineup of the PV series fixed angle variable displacement hydraulic pumps for aircraft and marine systems optimization. The numerous important improvements briefly discussed at the right indicate that these advanced design pumps are destined to set new standards of performance.

All series have integral automatic pressure compensator and a broad range of control methods. This advanced design requires substantially fewer parts than conventional design . . . and it has reduced to a minimum the number of external sealing elements. Now, for the first time, the power saving (and heat rejection) advantages of variable displacement are available in pumps of fixed displacement envelope and weight.

When first announced last March, only the smallest unit (Series PV006) had completed exhaustive endurance tests and was available. Now three more series (PV012, PV018 and PV028) are ready for system application. Three larger sizes are in the development stage. For further information write for Bulletin A-5233.

IMPROVED LIFE

Rebutative endurance tests have proved these new pumps meet the requirement of new MIL-P-16680 specification (i.e., 750 hours at rated rpm which is a very substantial increase over the 560 hours previously required).

INCREASED SPEED CAPABILITIES

The maximum recommended speeds (both continuous and intermittent) have been greatly increased for all sizes without exception . . . some three times for some models.

SAME HIGH EFFICIENCY

Volume efficiency is from 95% to 98% over a pressure range of 300 to 3000 psi. All the improvements mentioned here have been made without any sacrifice of the exceptionally high efficiency inherent in Vickers axial piston type pumps . . . under partial as well as full flow conditions.

IMPROVED RESPONSE

The PV006 series is capable of full flow to zero flow response in 0.02 sec and zero flow to full flow response in 0.04 sec without pressure oscillation.

MINIMUM PACKAGE

These PV series variable displacement pumps have practically the same envelope as constant displacement units of equal output. In comparison with standard variable pumps, the reduction in envelope varies from 70% to 15% as size increases.

IMPROVED CONTAMINATION RESISTANCE

Performance of these new pumps is greatly improved even when operating with contaminated oil. This improved contamination tolerance results from changes in both design and materials.

IMPORTANT WEIGHT SAVING

The new advanced design pumps represent a 30% increase in power-to-weight ratio over any other variable displacement package now available. The magnitude of this improvement is evident from the fact that every added pound of component increases a machine's gross weight from 30 to 70 pounds.

IMPROVED RELIABILITY

Exceptional capabilities (high speed, long life and contamination tolerance) under extreme conditions . . . even greater under normal application.

PARTS STANDARDIZATION

Major parts are interchangeable for fixed and variable displacement pumps and for fixed and variable motors in each series. The standardization results in customer savings.

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**Whatever the shape
of things
to come . . .**

Future shapes for the space vehicles of the future already are on the boards. Even more radical designs are taking form in the minds of engineers. And their parts and components will just as radically differ from those produced today. New standards of precision and new methods of working new materials will be required.

One thing at least is certain: the same design, development and manufacturing experience which made the transition from aircraft piston engines to jets will be needed to produce these shapes of the future. Since the early 1950's, Ex-Cell-O has been among the major suppliers of machine, parts and assemblies to the aircraft industry. In that time it has built a reputation for extending the frontiers of precision.

Today, Ex-Cell-O manufactures such components

as: actuators, blades, fuel nozzles, actuators, valves and fuel controls. Tomorrow? Well, perhaps you yourself have a problem which Ex-Cell-O's long experience in the production of precision controls and assemblies might help you solve. If so, why not contact Ex-Cell-O today?

IN CELL FOR PRECISION **XLO**

EX-CELL-O *Aircraft Division*
CORPORATION
DETROIT 22, MICHIGAN

MAN AND MISSILES FLY HIGHER, FASTER AND SAFER WITH PARTS AND ASSEMBLIES BY EX CELL-O

**Ground Speed & Drift Angle
Any Time, Anywhere, Any Weather**

In almost every instrumentation for the line now being developed, the use of GPL navigation systems. These systems provide speed and drift angle measuring instruments making them indispensable for military and civilian uses.

A single system component may be the most accurate 0.47 degree drift angle in any system flying this way.

To find the ground speed the pilot

As an as general direction. When the drift angle is in that the drift angle is increasing, he knows that he is going east the air frame. When the drift angle reaches a maximum, he knows he is in a turn. When the drift angle falls to zero, when the drift angle is in the opposite the system will follow the course and keep going, giving maximum benefit.

Cross-section of a headline

Headlines were made the day a GPL navigation system guided a USAF B-47 into the jet stream over California, set her down only 5 hours and 47 minutes later in sight of the Atlantic!

This dramatic use of GPL Doppler Navigation Systems is just one application of their basic function — precise point-to-point navigation — any time, anywhere, any weather. The systems work without ground aid or celestial fixes, have proved themselves over many millions of operational miles. They offer military and civilian pilots continuous, accurate navigation information, including velocity.

Trademark

SHORELINE — GPL achievements have opened up new ground, opened up new development opportunities. Send request to: Personnel Manager.

RADAN® Navigation systems, recently released for civilian use, are now available to everyone. They save precious time and add to the airlines, provide a precious margin of safety for all.

GPL **GPL**

GENERAL RESEARCH LABORATORY INCORPORATED, Pasadena, N. C.

The PLANE

Convair's F-102A, USAF single-seat, supersonic, all-weather, delta-wing fighter. The F-102A was the first of Convair's supersonic delta wings to become operational. It is powered by one Pratt & Whitney J-57-P-35 turbojet, with afterburner.



The PROBLEM

Canopy seal. A positive seal must be maintained between canopy and fuselage to hold cockpit pressure. The seal must stay resilient when exposed to extreme temperatures at flight altitudes; must also resist a relatively high concentration of ozone.



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For more information, write:

Dow Corning
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Midland, Michigan



beneficial occupancy

of test sitesis the crux of efficient

missile development

...AND ON-TIME ACTIVATION OF

TEST SITES IS THE PRINCIPAL PRODUCT
OF PAF'S SYSTEMS ENGINEERING

The economic benefits in terms of economy and efficiency in schedules that result from on-time availability of test and launch sites are well substantiated by all missile developers. Based on well known facts, the fact that every site for the Atlas missile program has been completed on or ahead of schedule.

PAF's end-to-end in this accomplishment have included design, construction, and installation of all electronic utility facilities of instrumentation, controls, servicing, and communications, and planning and validation of the complete electronic complex.

PAF has demonstrated its ability to modify test stands in support of missile design changes in less time, at lower cost—therefore PAF can best support your flying schedule.

For a complete report on PAF's performance on the Atlas program, or for a general proposal on the services that can be supplied on other missile programs, address: Arthur P. Jacob, Executive Vice-President.



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WESTINGHOUSE INGENUITY Opens the Way to Better Jet Aircraft Performance

1004 Jet Inventions in the Last Two Years

Engineering and research scientists at Westinghouse made 1004 invention disclosures—each representing an improvement in jet engine design—during 1956 and 1957. The number of inventions this year is keeping pace with previous years, proving that creative engineering at Westinghouse is striving constantly toward better, more efficient jet propulsion.

Westinghouse, designer and builder of the first American turbojet, now holds more than 175 U. S. patents—many of them basic patents—on the jet

engine. A few of the Westinghouse "firsts" in the field include the axial flow compressor, iris exhaust nozzles, annular combustion chamber and step-wall combustion liner.

The Aviation Gas Turbine Division is a completely integrated facility for design, development, testing and production of propulsion systems. For further information, write: Westinghouse Electric Corporation, Aviation Gas Turbine Division, P.O. Box 280, Kansas City, Missouri.

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It takes brains ...

to guide a missile ... mechanical brains, that is, like this tough test unit **ANALOG** digital computer module. **ANALOG** has put a great many brains to work designing a fully transistorized and miniaturized digital computer, a critical part of **ANALOG**'s all-weather guidance system for the Air Force ICBM Program.

More brains, the human kind, are now needed for **ANALOG**'s mental role in the Air Force ICBM Program. Specialized senior engineering and technical management positions with excellent growth potential are now available. Write to **ANALOG** Professional Personnel, Garden City, N. Y. Prompt, convenient, confidential interviews.

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—aimed for the future in solid rocketry

Astrodyne was founded early this year to bring together in one productive group all the skills, experience, and facilities it takes to design and manufacture America's major solid propellant missile systems.

From Phillips Petroleum Company came men with impressive backgrounds in research, design, and manufacture of superior solid propellants. From North American Aviation came men who know missile systems management, and who have designed

and built the largest rocket engines in use today.

Today, Astrodyne has the experience to design, develop, and manufacture complete propulsion systems, extruded and cast propellants, solid propellant rocket motors, and boosters, and gas generator charge for auxiliary power units.

Inquiries are welcomed on any phase of the solid propellant field—from preliminary design to quantity production.

ASTRODYNE, INC.
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Space Team Leaders



now available MAMMOTH EXTRUSIONS

Big magnesium and aluminum extrusions produced from Dow's 13,200 ton press

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Here's what the big press can do in the way of magnesium and aluminum extrusions to meet your special requirements.

Check this list:

1. **LARGER EXTRUSIONS.** Sizes up to a circumference circle of 36"
2. **LONGER EXTRUSIONS.** Up to 80 feet in length
3. **THINNER SECTIONS.** Down to 0.125"
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YOU CAN DEPEND ON **DOW**

President Eisenhower's nomination of T. Keith Glennan, president of the Case Institute of Technology in Cleveland, as administrator and Hugh L. Dryden, director of the National Advisory Committee for Aeronautics, as deputy administrator of the new National Aeronautics and Space Administration is the latest in a series of moves designed to get this vital agency into dynamic action as quickly as possible.

Mr. Glennan's nomination to the NASA top post should be viewed from the perspective of the administrator's temptation to pass this pay \$12,500 a year plan to a purely political headman in a permanent position.

In comparison with some of those types who were under active consideration, Mr. Glennan's appointment is a step in the right direction. He has some technical background in electronics, a field in which the old NACA never needed much capability, but which is vital for the new space agency. He also has experience in the Washington political mill as a former member of the Atomic Energy Commission. Mr. Glennan is no stranger either to the personnel, operating methods or shortcomings of the National Advisory Committee for Aeronautics which will be the nucleus of his new agency.

In Cleveland, he had an opportunity to watch the workings of the NACA's Lewis Propulsion Laboratory and knows well its able director, Edward R. Snodgrass, and his principal technical aide, Abe Silverstein, who is destined to play an increasingly important role in the space arm of NASA. It is the Lewis Laboratory that has already explored new methods of propulsion required for space exploration such as high energy rocket fuels, ion propulsion and nuclear powerplants. Mr. Glennan has a demanding and difficult task ahead of him. He will need all of the support that he can get from industry, science, government agencies and the American public.

Mr. Glennan is particularly fortunate in having the personnel, laboratories and reputation of the NACA as the nucleus for the new agency. It would be surprising to find a more solid, worldwide foundation on which to build the new venture. However, we must confess that we share the general disappointment over the failure of the President to nominate Dr. Hugh L. Dryden to the top NASA post which he richly deserves, both for the outstanding technical record of NACA under his leadership during the past decade and for his selfless devotion to the service of his country in the face of the persistent prospect of much higher financial reward from private industry.

There is no glossing over the fact that Congress and the President have given Dr. Dryden shabby treatment. Coming at the same time as the pointed criticism of John Hyman Backover, the power is seldom passed unscathed, from White House ceremonies honoring the transatlantic conference cruise of the Nautilus, it spotlights one of the symptoms of basic tensions between scientists and cabinet and political men that has so much to retard our progress development potential.

We are appalled and deeply disappointed by the performance of certain members of the House Select Committee on Aeronautics and Space Exploration who carried an otherwise sound record with a bitter and

thoroughly unexamined attack on Dr. Dryden while the nomination was under final consideration. There is nobody in the House or Senate who can support Dr. Dryden's record for selfless service to his country during the past two decades and particularly during his brilliant tenure as director of NACA since 1947.

We suspect there were three main sources of congressional dissatisfaction with Dr. Dryden. All are equally avoidable.

First, he was in the position, shared by so many military and federal agency leaders, of having to present a budget to Congress which even today appears very grossly inadequate. NASA was permitted by the Budget Bureau, which still regards the whole exercise as a costly tap to public opinion and of little real value, about half the amount Dr. Dryden and his cohort proposed to support the initial space exploration program.

Second, some committee members, who were impatient to have photos prophecies perfected tomorrow and who demonstrated their credulity to scientist witnesses by "proving" how it is possible to go 30 mph faster than infinitely accelerated scientific velocity displayed by Dr. Dryden when he refused to endorse proposals expounded by the "scale of" scientists of space and starbombs, insisted on a scientifically sound and valuable program. It is this very fact that Dr. Dryden has in the past had the moral courage and scientific conscience to resist since the pressure generated by technical "scale of" scientists that has made his administration of NACA so successful and universally respected in international technical circles.

Third, some committee members seemed so thick that with promises of "outstanding the Russians" would accomplish more than a scientifically sound program vigorously executed. They completely ignored the fact that, during the 10 years of Dr. Dryden's regime at NACA, this country remained significantly and consistently ahead of the Soviets in what was then NACA's main area—supersonic combat aircraft. Here is the sad spectacle of a man who kept his agency well ahead of the Soviets in what he regarded for 10 years being pulled back by some congressmen because he prefers to back his position with a record of solid performance instead of "pie in the sky" claims which nobody could really substantiate today.

It is no secret that Dr. Dryden has been "harassment" with offers from private industry ranging up to six figures during the period when he has toiled unscathed and uncompromisingly on a government salary of \$75,000. If it is this example, plus the technical freedom and soundness of the NACA's research and development programs, that has kept dozens of its key technical people from drifting off to bigger financial rewards from private industry.

It is a true measure of the man that Dr. Dryden was willing to accept the post of second in command of NASA where he will continue to work wholeheartedly for the success of the agency's mission while then check the whole situation with notified thought, check as individual plans and leave his congressional critics to be wrong on by the "scale of" scientists of space.

Over his gut goes to Dr. Dryden! —Robert Hietz

VIBRATION



The General Controls 3-way selector valve is undergoing a vibration cycle of 5 minutes duration, 75 to 500 cps, at gravitational loads in the order of 30 g's. Test specifications required fluid pressures of 1200 psi across two ports, with third port capped.

Purpose of test was to determine leakage under vibrational stresses comparable to those encountered in the fuel lines to jet engine afterburners.

Qualitative report by an independent testing laboratory stated that internal and external leakage after vibration cycle was zero.*

Every product in the complete General Controls line of line, ranging from gate valves to pressure switches, undergoes an exhaustive program of such tests before production release.

Another reason why the General Controls high trademark jets become a recognized standard of quality in the field of aircraft controls.

Why not talk to the men from General Controls about your next aircraft valve requirement?



GENERAL CONTROLS

MANUFACTURING DIVISION

Granville, California • Burbank, Illinois

St. Charles • St. Louis • Kansas City

Serving the United States and Canada

WHO'S WHERE

In the Front Office

Big Guy **Richard S. Brown** (USMC), director, Vibration Corporation of America, Chino, N. J.

John Schmaling, president, Stoll Corp., Chicago, Ill. (successor to John Sullivan, now local chairman)

George F. Merrill, regional vice president, Washington, Defense Activities, Control Electric Co., Washington, D. C.

Don Edwards, vice president, Westinghouse Electric Corp., 100 Madison Ave., New York, N. Y.

T. T. Condit, vice president sales, United Aircraft Corp., 11 Squidco Blvd., Danvers, N. H.

Donald R. Spiller, vice president sales, Aero Products and Western Division, Aero Products Corp., Redford, Ohio

William Jansick, assistant to the president, Midwest Aircraft Corp., Los Angeles, Calif.

Robert G. Brown, assistant to the president, National Electric Products Corp., Pittsburgh, Pa.

General Division of General Dynamics Corp., has announced the following reassignments: **R. B. Berman**, general manager, Washington, D. C., office and moved to **T. G. Langley, Jr.**, vice president and assistant to the president. **Glenn W. Hays**, vice president, Springfield, Mass.

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INDUSTRY OBSERVER

Scientists associated with Army's satellite program believe manned space flight may be delayed by several decades if the stars highly intensive radiation discussed by Explorers III and IV (p. 32 and AW Aug. 11), p. 200 extends indefinitely into the solar system, doubling in intensity every 50 mi. on earth data indicates it does at altitude up to at least 1,100 mi. One of Army's latest probe plans will be constructed to seek data as to how far in space the radiation extends. Army also has received permission from Advanced Research Projects Agency to work on an additional three satellite projects, including a reduction test, an inflatable sphere and a cosmic ray experiment similar to that conducted by Explorer I.

Kanawha Aircraft Corp., Bloomfield, Conn., is negotiating with Britain's **Fairair Aviation Co. Ltd.**, to produce **Fairair Kerosene VIOL** engine for the U.S. nuclear reactor. Working arrangements for Kanawha military and commercial rights in the U.S. and its territories have been completed but formal license agreement has not been signed.

Most Sound jet lighter aircraft now in operation have a thrust equal to or greater than their weight, according to **Kanawha** designer **A. M. Williams**. Written aircraft with similar characteristics include the Lockheed F-304 and Canada's **Avro CF-105**.

Sikorski Division of United Aircraft Corp. expects to have the "B" version of its turbo-powered **Sikorski S-62** helicopter flying early in 1959. New model will incorporate S-58 rotor system and new gear box. Upgrading of General Electric T58 engine is expected to produce up to 1,350 hp. Normal cruise speed is estimated at 125 kt, as compared to 90 kt for the S-62A.

One Sound design proposal for solving the structural heating problem on high speed aircraft: speed aircraft cells for a layer of fibrous about one inch thick between the outer skin and the inner structure; this from the pressure loads. **Kanawha** indicates that at one altitude and speed the insulation layer would reduce the time from three minutes to one hour that the inner structure requires to heat from normal GDC to plus 50C.

Curtis-Wright Corp., General Electric Co. and **Nuclear Development Corp.** of America are seeking preliminary studies for Atomic Energy Commission related to addition of reactor components used producing for mobile and land-based development under the system of satellite power units, extensive construction, low weight.

General Division of General Dynamics Corp. has an Atomic Energy Commission contract to survey all available information on light weight thinking development and to assist in detailed requirements for an experimental program necessary for development of thinking for compact reactors.

Bell Aircraft Corp. is developing a high-performance vertical takeoff designated the **Hyperion III** under Army contract for use in conjunction with Army's **Avrocar** program and **Avrocar** satellite and space vehicles.

Observations of Beta Ursina have been chosen by the Army as the first official Explorer control station in Europe. U.S. measuring and recording equipment of control unit is to be located in the vicinity of this system from Explorer IV. Second European station will be at **Blackburn** University.

Further studies of results of an underground explosion of a 17 kiloton nuclear device in Nevada last September have led Atomic Energy Commission to conclude that device 600 bases that could be used to study underground, both for response tests and potential uses. **Explorers** tested at least 700 tons of material and shocked about 300,000 tons of soil to sand. Temperatures up to 194F still existed in the central region three months after the shot.

Ralph M. Pearson Co., of Los Angeles, will make a survey of possible sites for atomic test ranges in several NATO member states under a contract from NATO's Advisory Group for Accelerated Research and Development.

surface-air
time-division

DATA LINK



Preserver of Peace

Developed and produced by Radio Corporation of America for the U.S. Air Force, the Time-Division Data Link system employs digital transmission for the transfer of control information between ground environments and airborne systems. The use of digital techniques of high-speed computers brings the concept of automation to the field of communications and guidance

of airborne weapons systems. Application of the system area: ground controlled intercept, missile guidance and control, return to base, on mode air traffic control, automatic landing systems, tactical support. This new RCA development is compatible with NATO Data Transmission Specifications, and is of important significance both to military and civilian flying.



DAIG 6

RADIO CORPORATION OF AMERICA

DEFENSE ELECTRONIC PRODUCTS

CAMDEN, N. J.

Washington Roundup

Air Defense Decision

Problem of what mixture of defense weapons will be chosen for use in the near future (AFL Aug. 31, p. 21) now is in the hands of the Joint Chiefs of Staff. They will make recommendations to Defense Secretary Neil McMillen, who was located last week on the center of a five-day defense gathering in Director of Central Intelligence William Mohr's office. Congress last pushed the whole question of defense weapons toward a decision by reducing defense requests for USAF Reserve and Army Nike Hercules buses, and warning that the country cannot support many and control networks, interceptors and a variety of missiles all at once. McMillen has been directed to determine what mixture or combination of missiles he wants to defend specific areas. Pentagon observers believe the decision may involve killing either the Reserve or Nike Hercules systems.

R & D Funds

Air Force channels 48% of its research and development funds into private industry, Navy 47.9% and Army only 41%, according to data submitted to Defense Department by the House Government Operations Committee. Other funds go to:
• Universities or other non-profit institutions: Army, 31%; USAF, 39%; Navy, 61%.
• William government: Army, 48%; Navy, 46.1%; and USAF, 41%.

Pyle Objection

Civil Aeronautics Administrator James Pyle has taken issue with the airline industry's plan to "divert" use of the phrase "air traffic control delay" by airline station managers explaining late arrivals and departures to passengers. In a letter to 33 airline presidents, Pyle complained that this explanation for public address systems and cockpit signs was "all too often used interchangeably" and called for a formal assessment of each individual delay when necessary in a series of holding public confidence in airline operations and the air traffic control system.

National Air Museum

Hayes has approval of plans and appropriation requests for a National Air Museum in Washington is the project source of Congress was arrived last week when the House Public Works Committee reported out the Senate bill. Exact location of the museum must be approved by the National Capital Planning Commission. The design must be approved by the Commission of Fine Arts.

Runway Debate

Air Line Pilots Assn. says runway configuration for the proposed Washington International Airport at Chantilly, Va., may fail to meet the needs of jet operations for which it was designed.

ALPA spokesmen were particularly critical of an announcement last week by the Department of Commerce that 1,000 additional acres of land had been purchased to retail dual out-and-back runways. The runway will be shifted 20 deg. to the north to take advantage

of prevailing wind directions. Asserting that their studies indicate lands in the area generally come from either a direct north or northeast direction, representatives of the pilots' organization contend the runway runways should be shifted further to a heading of between 300 and 318 deg. and the north-south runways 15 to 20 deg. to the northeast. Failure to do so, they contend, will subject jet aircraft to "hazardous" increased landing conditions.

USAF Transports

Air Force had a total of 1,315 four-engine transport aircraft as of Jan. 31, according to a USAF report to House Appropriations Committee. The largest number of the big transports were assigned to Military Air Transport Service, 601; Technical Air Command, 106; Air National Guard, 111; Strategic Air Command, 158; U.S. Air Force in Europe, 72; Air Research and Development Command, 45; Pacific Air Force, 16; Headquarters Command, 22.

No-Shew Dispute

Civil Aeronautics Board last week voted not to order, in the coming no-show battle between American Airlines and a number of carriers fighting to retain possession of non-scheduled flights in the west.

Complaints against American's filing to subvert a "restriction" plan at a result of a May meeting of the Air Traffic Conference were made by Capital, Delta, Eastern, National, Southern and Trans World Airlines, all of which favored retention of non-scheduled post a December 1 deadline voted by ATA. In dismissing the complaints CAB turned the case to a management responsibility but rejected its concern over apparent failure of the industry to extend the no-show plan beyond the December date and urged prompt action to insure continuing efficient control of no-shows.

Soviet Translations

Foreign Technical Information Center authorized earlier this year by Congress to provide American sources and indicate a central source for access to translations of Soviet technical information is now an operation. The center, established as part of the overhaul of Congress's Office of Technical Services will publish abstracts of all articles appearing in 141 Soviet Technical Journals, many items of important sections of "Tekhnicheskii Zhurnal," the Russian air abstract journal, and a semi-monthly series of review notes of Soviet aircraft designed by the Central Intelligence Agency. The center estimates that its release will average 10,000 abstracts and 10,000 complete translations a year.

Kunzig Appointment

Robert L. Kunzig, administrative assistant to the chairman of the Civil Aeronautics Board, has been named by President Eisenhower to become a commissioner of the Foreign Claims Settlement Commission subject to Senate confirmation. Former chief counsel for the House Committee on Un-American Activities during the 51st Congress, Kunzig has served with the CAB for the past three years.

—Washington staff

cial air program. Sales increased from \$745,711,139 last year to \$799,746,539 this year.

Continuum's engineers on the Gulf stream turboprop executive transport and other projects, a total of \$8,152,936 in the last six months of 1978 cut earnings of \$1,910,804 compared with \$3,171,609 last year. Sales increased to \$487,512,682 for the first half of this year.

Some Airlines' Earnings Decline

Washington—United Air Lines last week reported a net profit of more than \$1 million for the first six months of 1978 as compared with \$1.4 million for the same period of 1977.

Profits from the sale of aircraft brought the net earnings total to \$1,108,514 for the first half of this year, while aircraft sales added \$1,016,414 in net earnings for the same period of 1977. Operating revenues for the period totaled \$185 million, reflecting an 11% gain over last year's figure for the period. Operating expenses for the period totaled \$174 million, an increase of 8% for the first six months of the year, representing a cost of \$139,356,738.

Other factors indicated less important gains or losses in net results than last year's 1977. They included:

- **Eastern Airlines** announced a net profit of \$1.9 million as compared with \$5.5 million for the first six months of 1978. Operating revenues for the period totaled \$119.7 million, a 2.5% above last year's figure, while operating expenses decreased by 0.3% to \$120.9 million for this period.

- **Capital Airlines** reported a net loss of \$755,611 during the first six months of this year as compared with a loss of \$769,941 for the same period in 1977. Operating revenues of \$120 million offset a gain of \$6 million over the first six months of last year. Operating expenses of \$127 million represented a net increase of \$6 million over the first six months of last year.

- **Boeing Airlines** reported a net profit of \$270,568 for the six months ended June 30, a 45% gain over earnings of \$81,208 for the same period of 1977.

F-104 Grounded

Lockheed F-104 fighter aircraft were grounded last week by the Air Force as fuel changes are made in the 100 fuel and temperature outside air in the afterburner engine model. Air Force officials would not comment on any possible casualties, but the grounding of F-104s could mean some type of shut down of the Cape Canaveral (AFC) Area, p. 34. Investigation of the accident is still in progress.

as against last year's \$98,611,032. Grumman led the high methods would continue through this year.

Because of its F-27 Friendship units (July 18, p. 31), Fairchild's 1978 sales are expected to be \$5,051,080 on sales of \$47,301,080.

This compared with earnings of \$412,000 on sales of \$50,186,000 for the first half last year.

Operating revenues for the period were \$55.2 million, as compared with \$50.2 million for the first half of 1977. Operating expenses of \$11.5 million for the first six months of this year were approximately \$8.4 million above those of the same period in 1977.

- **Northwest Orient Airlines** reported a net profit of \$721,717 for the first six months as compared with \$938,515 for the same period of last year. This year's figure includes \$429,079 income from property disposed as compared to none last year. Aircraft sales added \$1.1 million to the sale of aircraft during the first six months of 1977. The airline's operating revenues for the 1978 period were \$44 million reflecting a 15% increase over the six months period last year.

- **Continental Air Lines** reports a net loss of \$517,527 for the first half of this year as compared with a net profit of \$1,014,416 recorded for last year's period. Operating revenues for the same period were \$119.7 million, a high of \$12.2 million for the first six months of this year over the \$10.2 million recorded for the same period of 1977. Operating expenses, however, increased 50% with a total of \$12.5 million for the first half of this year.

- **Seaboard & Western Airlines** had a net loss of \$1,225,209 for the six-month period of this year as compared with a net profit of \$661,719 for the first half of 1977.

- **KLM-Royal Dutch Airlines** reported a net loss of \$677,800 for the first six months of this year as compared with \$5 million for the same period last year. Operating revenues of \$197 million decreased 51 million during the first half of this year from the \$50 million recorded for the first six months of last year. Operating expenses for the first six months were \$194.6 million as compared with \$193 million for the first half of 1977.

- **Delta Air Lines** is a preliminary report on its stockholders announced a net profit of \$1,025,115 for the first six months of this year as compared with a profit of \$2.6 million last year. Total operating revenues for the first year were \$41.1 million as compared with \$75.5 million operating expenses for the period.

Tighter Scheduling Cuts Tenno Costs

New York—Tenno Aircraft Corp. is a monthly commitment to the other airlines, to cut costs, will save about \$700,000 in aircraft designs this year through tighter inventory control and scheduling. Tenno President Robert McCulloch told the New York Society of Securities last week.

Tenno will process 528 million lbs of material in 1978 than it did last year, McCulloch said, because the trend to drive in high quality, low weight products, products that require the application of more skilled labor and less material than in the past.

Because of the closer scheduling of supplies and materials was from the practice of having large quantities of material for long production runs, Tenno will have over its inventory last year this year, McCulloch said.

By closing smaller accounts, Tenno was able to reduce its bank loans from approximately \$1.2 million to \$4 million with the addition of new equipment in growing inventory, McCulloch said.

"Competition is no longer confined to the people we are accustomed to looking against," he said. "In fact, the large price contractors are bidding right along side of us. There are obvious cost overruns being bid being submitted against which we do not have a chance. We are in a race to the bottom. It is to be in the bottom because it is our way of life. We have now dropping the bottom from being the top. I was the low bidder."

In the first half of 1978, Tenno had 90 projects, said McCulloch, and this was a pretty good thing to do, compared to the 1977 period. The company is working on 21 projects for comparison with the first half of the year.

McCulloch estimated that sales in 1978 will be half million and half million and more. The estimated 1978 total sales of \$120 million and the estimated of \$80 million manufacturing are expected to be \$18 million for IRAN and \$28 million in aircraft and aircraft.

Major subsidiaries include:

- **Reier B-32** jet aircraft (18 ft)
- **McDonnell P-501** jet aircraft and photo eye

- **Lockheed F-104 wings**
- **Kearney Hawk wings**
- **Lockheed Polaris engine fittings, supplied to Armet Corp.**

McCulloch said that Tenno has developed include:

- **Method to have stainless steel houses with sections in double curvature with possible use for 30 ft aircraft**
- **Two in two sections on the ad-**

der let for the North America B-70 and F-102, which will have performance in this year.

- **Higher performance version of the Conquest air-to-air missile under development by the Navy**

- **Kawasaki air-to-air missile, which would have development of the traffic control and missile stage etc.**
- **The device, which converts radar signals into a continuous trace plot, is an off-the-shelf item and has been delivered to Patrick Air Force Base, Fla.**
- **The White Sands Missile Ground and the Navy's Ft. Meigs, Cal., range for monitoring range traffic**

Talos Scores Kill On Kingfisher Drone

Los Angeles—An Army Talos guided missile reported in a kill against a Lockheed Kingfisher target aircraft which achieved significant speed after being launched from a Boeing B-51D above White Sands Missile Range, N. M.

Radar data on altitude, speed and course was fed into the Talos defense and search system.

Lockheed firing error indicated in the drone, basically an A-7, transmitted data to a ground receiving station indicating that it had been scored.

Kingfisher is equipped with a radar target identification device to enable the target to maintain a number of altitude and velocity. These also are equipped with a radar eye to facilitate capture.

Boeing is prime contractor for Talos.

Thor Delivered To Cooke AFB

Fort Tarrant International, says before made to be delivered to Cooke AFB for use in various training programs and in evaluating test stands and being equipment arrived there last week.

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Norway Inaugurates NATO Radio Network

Fort—First section of NATO's new "landed radio" communications system has gone into operation in Norway. Norwegian radio is first step in a program which will connect NATO air units from Norway to Turkey. Use of leased radio system, NATO said,



Boeing Proposes Mers Vehicle

Boeing model of space vehicle to make close-up studies of the planet Mars is important in Boeing's design. Richard D. White (standing) and James K. Heiber, who designed the vehicle, are shown in the background. The vehicle is a small, two-wheeled vehicle, and the model is shown in the foreground. The vehicle is designed to be launched from a Boeing B-51D above White Sands Missile Range, N. M.

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Ford Instrument Gets Navy Computer Award

Washington—Navy has awarded Ford Instrument Co., a division of Sperry Rand Corp., a \$7.4 million contract for production of guided missile computers to calculate a surface-to-air missile's trajectory in relation to approach angle.

The competing equipment will be used by Navy aboard missile cruisers and destroyers now under construction which are scheduled to enter the Navy's fleet.

Radiation Poses Manned Space Problem

By Philip J. Klein

Iowa City, Iowa—Three basic questions upon which the whole future of manned space travel now depends have been raised by the unusually intense radiation discovered by Ames's Explorer III and confirmed with the addition of independent checks by recently launched Explorer IV (AW Aug. 11, p. 35). They are:

- **Radiation depth.** Does extremely intense radiation extend not only into the solar system indefinitely or only near the earth? Indeed, if it is thought that radiation might be found within a thin belt which could be quickly penetrated by space vehicles, now, scientists find that the radiation extends at least to 600 mi. with no signs of fading off.
- **Radiation gradient.** Explorer IV data analyzed to date reveals that intensity of radiation decreases appreciably every 68 mi. beginning about 170 mi. up. Important, therefore, is whether it continues to build up at the same rate.
- **Type of radiation.** Originally, scientists suspected that radiation was due to electrons, which are only about 1/10th as lethal as protons. Explorer IV data raises the suspicion that radiation comes from more lethal particles.
- **Uniqueness of Iowa satellites.** headed by Dr. James Van Allen are preparing new instrumentation packages for Explorer V and other Ames space probes.

to obtain additional pieces of information about the nature and depth of the radiation.

If the radiation extends indefinitely into outer space and if it continues to double in intensity every 60 mi. and if it consists of protons or other nuclear particles instead of electrons, the space standard is as far a lethal trap along the vehicle career as a large amount of shielding.

For example, data analyzed by University of Iowa scientists reveals that satellites launched on Explorer IV at 1,200 mi. altitude were exposed to a minimum of 10 roentgen per hour if radiation is electrons; 100 roentgen per hour if radiation comes from protons.

Radiation Damage

According to Atomic Energy Commission figures, a person exposed to a total of 100 roentgen has only a 50-50 chance of living through the next 30 days.

The AEC recommended that a reasonable safe weekly dosage is only 0.1 roentgen.

Early post-Explorer III speculation that high level shielding might prove sufficient to protect the space traveler has been shattered by Explorer IV which carried two Geiger counter tubes, one of them shielded with 4 in. of lead. At low altitudes the lead-shielded counter experienced only 6.6

in many protons in the unshielded one. But at higher altitudes and radiation intensities, the shielded counter experienced particles at least equivalent to the unshielded one, according to Carl Mifflin, chief of the University of Iowa Physics Department.

Intense radiation if it extends for any great distance beyond the earth may eliminate the possibility of obtaining reliable photographs during a lunar probe, since film would be completely fogged by the radiation.

Limited to small amounts of payload, Iowa University scientists are proceeding with modest experiments aimed at showing, if possible, present estimates, according to George Ludwig, a member of Van Allen's group. For example, one of the satellite's counter in the Explorer V package is being used only to make it accurate to electron radiation but without defining its accuracy, to protect or other nuclear particles. If this shieldless counter records more than the usual number of radiation particles as Explorer IV, scientists will know the radiation is predominantly protons or other heavy particles.

Over it has been established whether the radiation comes from electrons or from heavier particles, scientists will be able to determine the average cosmic level of the radiation, defining the rate of penetration experienced by the shielded and unshielded Geiger counters which will be carried on Explorer V as well as on Explorer IV.

In subsequent space probes, scientists expect to substitute van Allen's for the Geiger counters in order to measure the maximum rate of the radiation, which is a direct measure of the biological hazard involved for space travelers.

Other Discoveries

If earlier tests show the radiation is not from electrons, subsequent experiments will use different types of detector elements in the radiation counters in order to establish whether the heavy particles are protons, Alpha particles or other radiation.

Early new bit of data, like another piece in a jigsaw puzzle, will enable scientists to further narrow down their search for the basic nature and source of the radiation.

The answer to the important question of how far the radiation extends into space may come when the Athena or Ames launch one of their latest probes, or earlier if Ames decides to try to an extremely high space, highly elliptical satellite orbit like that of Explorer III.

University of Iowa scientists have analyzed the data from several hundred over sixteen probes (not complete orbit) made thus far and in all the data has been extremely "self-consistent." This evens the chances that these measurements are accurately reporting what they are finding in space.

Data involved to date has not been sufficient to establish the relationship of radiation intensity to latitude and longitude except to suggest that radiation is not synchronized with respect to earth.

Explorer IV data also indicates that the radiation is not isotropic—that is, it is not equally intense from all directions.

This has been established from the two-track variation in the satellite's counter rate as Explorer IV's attitude propeller lashed at its orbit. However, there is no way of establishing what direction Explorer IV's satellite counter is pointed at the instant of maximum intensity.

Explorer IV data is being transmitted continuously by two transmitters. The Van Allen's transmitter, operating at 145.95 mc. puts out about 75 milliwatts. Ames' transmitter, however, operating at 148.5 is rated 150 milliwatts. Both are expected to operate for approximately two months on their batteries before going dead.

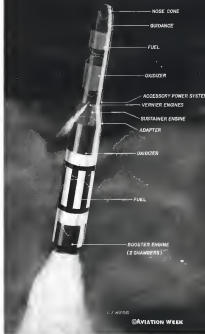
Despite the fact that Minuteman transmitter is operating at lower power level than Explorer I and III, it has been going much better performance. In earlier launches, ground stations were able to obtain information data for about two to five minutes as satellite came into, whereas Explorer IV is providing a usable signal for 5 to 30 min., according to Ludwig.

Westinghouse Given Shelter Contract

Westinghouse Electric Corp. has received purchase order from Douglas Aircraft Co. for approximately \$1.7 million in electrical equipment to power remountable shelter for Douglas' Thor intermediate ballistic missile.

The shelter will completely enclose the missile plus its launching cradle, both of which will be positioned horizontally on the firing pad. When prelaunch preparations are complete, shelter can be rolled back, its full traveling length to permit the Thor to be erected vertically on the firing pad.

As part of the order, Westinghouse will manufacture meters and control equipment at its Buffalo, N. Y., plant; go units at its Natural Bridge, Pittsburgh. The electrical units will be assembled at the company's armor factoring and repair facility in Cupertino, Calif.



AVIATION WEEK editor's description of Westinghouse's \$1.7 million order in building and erecting tests at Cape Canaveral, Fla. External components to be classified. First firing of Thor, prototype missile is due in October (AW July 21, p. 37).

Soviet Radiation Findings

Moscow—Cosmos radiation findings made with Soviet Sputniks agree closely with data collected by U.S. satellites and indicate that Soviet instruments are of high quality.

Professor Sergei N. Vernov, speaking at the recent International Geophysical Year meeting, told of measurements of considerable cosmic radiation increases at various times and locations. One increase in intensity of 50% in seven minutes was measured by two Cosmos on Sputnik III on 30 Aug. 10, latitude lat. Nov. 7, Vernov said.

Cause of the surge has not been determined, suggesting it might be due to an increase in electron flux within the earth's field rather than an increase in primary cosmic radiation.

Satellite counters on Sputnik III registered high intensity of protons at the same times when the November burst was observed, Vernov said. He said findings indicate relatively electron currents at high altitudes, a fact shortly reported by U.S. scientists. Vernov said "a large number of secondary particles accumulate near the earth and make possible measurements from one hemisphere to the other, with high speed accurate recording instrument."

- Two satellites were made on the basis of low energy radiation near the earth.
- Decay of cosmic radiation from cosmic rays striking the atmosphere with secondary particles diffusing and ionization forming into positive plus electron with a half-life of 25 min.
- Electrons from the sun arriving at speeds of 100.

Vernov suggested similar low energy radiation may be expected in the neighborhood of other planets.



SAC Missiles on Display

Two U. S. Air Force Strategic Air Command intermediate range ballistic missiles, Thor (left) and Jupiter (right) are shown, with Soviet surface-to-aircraft missile, at center. Army-developed Jupiter is in 3,500-2,000 mi. category, is in the Thor. Soviet has nuclear capability and can travel 3,500 mi. per minute in Thor & Whiskey (R) category.

Space Technology

Satellites Not Missile By-Product, Jet Propulsion Laboratory Says

By Russell Hawkes

Pasadena, Calif.—Satellites and missiles should be closely related technologically and economically, but satellites must not be regarded such as missile program by-products, space officials attending an Office of Naval Research Seminar here were told. Headquarters of Jet Propulsion Laboratory, California Institute of Technology, was the speaker. The one closest was drawn from a Jet Propulsion Laboratory study for Army Ordnance Corps.

Arguing that satellite development should not be segregated from missile programs, Rabinowitz pointed out that reliability of a device is largely dependent upon familiarity with it. At least until recently, only the military has had sufficient funds to perfect the large number of tests which provide this familiarity.

Among the issues to be heard by satellite agencies from past missile programs is the common fact that the field

degree of success of a missile program has often been detected quite early in its development. If a missile program starts well, it generally ends well. If it starts with failure, it is rare that a successful missile is ever produced.

One possible explanation is that the testing program took an area less than could handle. Another is that reliability is strongly dependent upon good management which is reflected in good missiles, while bad management leads to breakdown.

Missile programs can also teach satellite builders something about estimating the date on which the program is complete. Dr. Louis G. Dunn, former director of Jet Propulsion Laboratory, once said of the Corporal program that development would be complete when three consecutive missiles had landed within one circular probable error of the target.

Rabinowitz said that in many missile programs a strong civil-military link has appeared between the two services

and the point at which, in retrospect, the research and development phase has ended.

Rabinowitz also pointed out that even previous indications that a missile may not be regarded as a true weapon until it has undergone flight tests to three, four or five days by military personnel. Rabinowitz added together factors to be learned from missile experience. He said, apparently, it is possible to develop one contractor for a considerable length of time by purchasing a series of more and more complex projects based upon earlier programs, rather than all at once, even out of the research and development phase.

What seems to be still more, it is possible to come up with plans that may prove for those who in testing, as well as, proposed in practice, that the program is now available because the previous program is now well under way.

It is worthwhile to compare this with the way in which the Russian program is going. The first is a dangerous thing in Russia, therefore, many organizations accomplish their work in one way and prepare to do it in the next so that by the end of the second year they can show produce success. If parts of their work don't go well, they just don't prepare them in the following year. Rabinowitz attended many of the Russian meetings. He said that between



Lockheed Aircraft Corporation, in cooperation with Shell, developed one fuel tanker to speed the servicing of the Electra.

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LOCKHEED'S NEW GLUCER... first U. S. prop-jet tanker... has such advanced design features that ground servicing time has been cut to only 12 minutes.

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the new airfield, deliver over 100 gallons of Aviation Turbine Fuel a minute. Fuel is pumped aboard into all four wing tanks simultaneously through a new Lockheed single-point fueling system.

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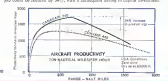
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Graphs are based on the ATA formula, which shows that the direct operating cost of the "540" is as much as 10% lower than the "500". This applies naturally to stages from 600 miles, under which the graphs indicate that the two are approximately equal. Not reflected, however, are additional reductions in fuel costs and engine maintenance costs because of the more basic reliability of turbine engines and a reduction in vibration. This makes the "540" more economical than the "500" over any major length.

Graph below shows the very definite superiority in aircraft productivity of the Canadair "540" over the "500", which is as much as 30% at short appliance ranges. This indicates that for equal annual utilization the "540" could produce 30% more ton miles, or, conversely, the Canadair "540" can be required to do the same job could be reduced by 30%, with a consequent saving in capital investment.



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companies are seldom given a chance to prove a useful purpose. "It is a recognized limit of some officials, government or otherwise, to hand a committee a limited question in order to shake the official himself of the responsibility for decisions. This small group is not asked how the job should be done, but whether or not the past transfer proposal is technically feasible. Obviously, there are a number of technically feasible things which should never be done at all and others which should never be done by the proposing agency."

"Nevertheless, it is extremely rare for a committee to turn down a proposal and instead, suggest that a different manner should be given that job."

"It is still more rare for a committee, instead of a job might be done, to question whether or not the job should be done at all."

"The reason is not that the committee could not consider such possibilities, but rather that it was never asked to do so, and would probably never be asked again if it did."

Most technical committees are composed of persons of quite high administrative rank, who seldom have spent their two days a month for committee work. That situation makes some committees one month for the further technical aspect of the "new job." The committee has little opportunity to absorb the substance but also other committee members, Reichen and

Canada May Choose Primary Jet Trainer

Others—Canada may be ready to choose a primary jet trainer for the Royal Canadian Air Force to replace its present primary trainer type, a report of a Canadian House of Commons standing committee on estimates indicates.

The committee recommended replacing the RCAP's de Havilland Chipmunk and North American Harvard (AT-6) trainers with a fastjet powered primary trainer, replacing the T-35 Silver Star at an intermediate trainer. This would eliminate basic equipment and maintenance costs of present equipment, the committee said.

Most likely choice would be the Canadair CL-41, (JAN Nov 25, 1977, p. 31). Should the company has been developing with its own funds for such use. The committee noted Canadair's plant and air shows, the trainer before its report was written.

However, the RCAP has looked at various U.S. designs as well and has given no formal indication of a particular one.

The committee also recommended that if the Canadian government want

KLM Airliner Down On Atlantic Flight

New York—Wreckage of a KLM Boeing 747-200 Super II Coastal Jetliner last week on the North Atlantic, was believed sighted Thursday about 300 mi west of Skuasness. The plane, carrying 90 persons, left Shannon at 11:01 p.m. New York time on Aug. 15 and was last heard from by Shannon 19 miles later.

Aviation sources reported sighting the wreckage and several injured life floats but no sign of last Thursday there was no report of any survivors being sighted. Position of the wreckage was 51 deg north 17 deg west.

The flight in extra action with 91 economic class passengers and a crew of eight left departed Amsterdam at 6:15 p.m. New York time Aug. 15. Eighty-five persons boarded at Amsterdam and the other six at Skuasness. The flight was due at Coosbay, Newfoundland, on arriving at 7:30 a.m. Aug. 16, and scheduled arrival at New York was 1 p.m. Skuasness was on the alert at 2:05 a.m. At 11 a.m. the airline declared the plane definitely lost, with full personnel alerted.

Along with the Aero CF-105 Avro, production program, some cost sharing agreements should be made with other airlines who could use the supersonic interceptors. By the end of the month fiscal year in March 1978, Canada will have spent \$400 million on this air plane, or about \$10 million for each of the 40 test models that have been ordered.

New Models Highlight Farnborough Show

London—This year's Farnborough Air Show will have a mixture of civil and military aircraft on the show with combined content of "the show" which is a steady demand, as the sponsoring Society of British Aircraft Constructors puts it.

Among aircraft being displayed at Farnborough for the first time will be two of special interest in the helicopter field—the Eurocopter Eurocopter, and the Eurocopter Eurocopter 192 helicopter.

Blackburn S-19 attack strike bomber will give its first public workout and will probably be flown by an experienced pilot as well as the Eurocopter Delta 2, one of last year's show.

Both Eurocopter Eurocopter will be seen at several new engine test beds. Among other aircraft on display for the first time Saunders-Roe P-311 jet test turbine powered helicopter, Westland Westminster attack helicopter.

helicopter, de Havilland Comet 4 and Conquest II, Hawker P-311 jet test turbine powered helicopter, de Havilland Comet 4 and Conquest II, Hawker P-311 jet test turbine powered helicopter, de Havilland Comet 4 and Conquest II, Hawker P-311 jet test turbine powered helicopter.

News Digest

Canadair's Canadair helicopter engine transport made its first flight last week.

Newly built five other aircraft landed at Canadair's Farnborough plant, including a Canadair P-311 jet test turbine powered helicopter, de Havilland Comet 4 and Conquest II, Hawker P-311 jet test turbine powered helicopter, de Havilland Comet 4 and Conquest II, Hawker P-311 jet test turbine powered helicopter.

English Electric P-311 will be called "Lightning" according to British Air Council.

Westland Aircraft Corp. plans to submit 500 engines as a result of receiving a contract for 30 Model 107 twin turbine helicopters from the Army.

Dr. Willem F. Diederik, 59, one of the 12 original members of the National Aeronautics Committee for Aeronautics and in World War I was a pilot, was in the Air Force, where he served as a pilot. After returning to the "area of American engineering," Dr. Diederik had received prominence in both civil and commercial engineering. In 1941, he was the first recipient of the Wright Brothers Memorial Trophy awarded by the National Aeronautics Association for his "significant public service of advancing the art of aviation in the U.S." He also had received the Goddard Medal "for notable achievement as a pioneer in laboratory research and theory of aerodynamics and the development of aerodynamics for the design and development of aircraft propulsion." Dr. Diederik retired from NACA in 1955 but returned during World War II at the age of 52 to lead as special subcommittee on jet propulsion.

Australian Millican aircraft guided missiles will be tested on 7,000 acre range on the Salween Coast of Scotland next month. Millican is a 200 lb ground-to-ground radio controlled weapon.

Congress Approves Federal Aviation Act

Congress passes act establishing independent Federal Aviation Agency; CAA, AHB to be absorbed.

By Robert H. Cook

Washington—Congress last week approved the Federal Aviation Act establishing an independent Federal Aviation Agency with such major responsibilities to the administration's original proposal.

The President's approval of the bill will immediately make effective provisions pending for the formation of the new agency and for the qualifications of its first administrator who will be appointed in the White House.

Remainder of the act will become effective 60 days after the administrator takes office.

The agency, which will be responsible for the U. S. aviation system, will absorb the Civil Aeronautics Administration and the Aeronautics Administration Board.

As spelled out in the bill, the FAA Administrator would be responsible for:

• Development and operation of a common system of air traffic control and

navigation for both military and civil aircraft.

• Regulation of air resources in such a manner as to promote air safety and fulfill the needs of national defense.

• Promotion and development of civil aeronautics.

• Control of airspace and the regulation of both military and civil flights in the interest of safety.

• Coordination of research and development projects for air navigation as well as the installation and operation of navigation facilities.

Extensive personnel transfer and reorganization from all existing governmental aviation agencies will become the first task to implement the new agency, according to Elwood Quesada, special assistant for aviation to the President.

Quesada and predecessor plans already are under way to carry out the changes of duties, with a detailed "transition table" spelling out assignments and qualifications expected to be

made within the next three weeks. He particularly emphasized that the personnel shift involves only a reassignment of existing duties with no threat of lower job classifications.

Once the actual working staff has been assembled, FAA can concentrate on the top priorities of developing and implementing approved air traffic control procedures plus an expanded research and development program absorbing current knowledge gained by the Civil Aeronautics Administration and the Aeronautics Administration Board, of which Quesada is chairman.

While generally satisfied with the bill as approved by Congress, Quesada said that a serious, although the President to place FAA under the Department of Defense in time of war had caused confusion in some quarters.

The authority, he explained, is to promote language designed as an interim measure to protect military forces from loss of FAA personnel during time of war. He added it prohibits the military from war such loss between the time the agency begins to operate and such time as definite legislation is proposed

to handle this problem. He added that legislation specifically denoting the duties of military flight controllers assigned to military forces in time of war probably will be presented to Congress.

In its final form, the Federal Aviation Act adopts principles of the Air Commerce Act of 1926, the Civil Aeronautics Act of 1938 and the Aeronautics Administration Act of 1957, all of which—legislation which other acts that might conflict—will be automatically repealed upon the effective date of the Federal Aviation Act.

The Aeronautics Administration Board staff and projects would be united with the CAA's Technical Development Center to form a concentrated research and development division.

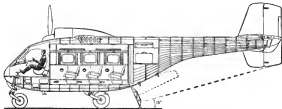
Civil Aeronautics Board members already authorized by the new act. CAA will retain its authority for extensive regulation of the airlines. However, it will lose its power to allocate airports and authority for the safety regulation of civil aviation. The Board retains responsibility for accident investigation and determination of probable cause.

As reported last by a joint House-Senate subcommittee, the bill only for a certain administrator with experience in a field directly related to aviation.

A proviso was added to the effect that if the administrator is a former regular military officer, his deputy should be a civilian without prior regular military service.

Conversely, the bill allows appointment of a regular military man as deputy if the change administrator is a civilian without prior regular military service.

Assurance of adequate military representation in the new agency is provided



An-14 Drawing Shows Transport Details

Engineering details of Russian An-14 Little Bear light transport are uncovered in this first drawing. Shows air passenger configuration, other models are used for pilot training, agricultural missions, forest patrol and sport activities. New door makes Little Bear adaptable to parachute jumping. Floor can be fitted with strong equipment and also for operation in low temperatures and down to 60 in. Lastest specifications from Russia show that the plane has a maximum gross weight of 7,600 lb., wing span of 65 ft., wing area of 475 sq. ft. and is 34 ft. long.

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by emphasizing the direct assignment of armed services personnel to the FAA subject to the sole authority of the administrator. Other recommendations to the Federal Aviation Act provide for:

• Right to participate in the Civil Aeronautics Board vote upon approval of the House deleted a provision for 15. The provision was not to exceed grades 16, 17 and 18.

• Five separate positions were added to the FAA plus a House deletion of a provision for 100. The provision was an addition to those presently authorized for the CAA, CAA and AHB.

Some separate positions of CAA would be transferred to the Federal Aviation Agency.

• Use of consultants was limited to 100 days in any calendar year.

equipment (ASDE). Also included are 41 radio beacons for radio aids and as far as with aircraft carrier.

The package further provides \$3,215,000 for an air traffic control operational studies for the CAA Technical Development Center at Indianapolis \$500,000 for a runway extension at Wake Island and \$1.2 million to re-habituate the airport at Norfolk, Alaska.

In addition the program calls for:

• Installation of instrument landing systems (ILS) at 19 new locations including a second ILS at Fort Belvoir.

• Control towers for 23 airports.

• Allocation of 34 radio beacons and 100 radio aids.

• Installation of 62 VORTAC systems and the acquisition of 158 existing VORTAC units with Tamas to make up VORTAC units.

CAA Reports Plans For Control Facilities

Washington—Civil Aeronautics Administration has made a preliminary plan for the implementation of its fiscal 1959 air traffic control and navigation facilities program at a cost of \$175 million.

Light program, of its kind in the agency's history, it provides for installation of long-range radar units for five CAA air route traffic control centers and the use of radio navigation from 11 existing or planned facilities.

Each time which installation will be accelerated into CAA control centers.

A total of 19 airport surveillance radar (ASR) will be installed at CAA traffic centers, 10 of which also will be equipped with airport surface detection

Los Angeles Renewal Recommended for SAS

Washington—Secretary of Defense, Louis W. Allen, has recommended for a renewal of its Strategic Air Command facilities and a new foreign air carrier permit for a route to Alaska, Sweden, Denmark, and Norway with the total cost of \$100 million.

In making the recommendation, Civil Aeronautics Board President Leslie C. Dornier released a "statement" to the effect that although approximately 100 is required to support a CAA program and destination studies of air traffic from the U. S. for March and September of each year is required for U. S. flag carriers.



How Douglas DC-8, Boeing 707 Compare Head-On

New section configuration of Douglas DC-8 (left) and Boeing 707 jet transports are shown here. Two angles in DC-8 nose are for cabin to supercharger, both aircraft have same nose sections. Note wheel fairings do not extend on Douglas jet and absent on Boeing 707. Round supports can be seen on engine tailpipes.

To increase
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Cessna's T-37 jet trainer
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CONQUEST IV jet transport takes off from Idlewild, New York, for soon test after making its first transatlantic crossing.

settings also were performed, the entire program consisting about 19 hr. The Conquest, in BOAC colors and first-class configuration, was believed for the hour to bring its gross weight up to the 114,000 lb. maximum and to simulate an actual schedule with 76 normal passengers and a full load of fuel. It carried 72,800 lb. of fuel at normal take-off, dumped 17,800 lb. over water in two operations and had 14,800 lb. of fuel remaining at the final landing.

Maneuvering was done at altitudes up to 10,000 ft. and the plane, reportedly handled well in the traffic pattern, accomplishing regular descent turns at 145 kt. unpowered. At maximum weight the Conquest used 3,700 ft. of the 9,500 ft. runway for its landing.

Crewmen aboard the Conquest recorded instrument readings at the various check points and conditions and this data will be forwarded to Betty Brunck and Newman, Inc., the Port Authority's sonic consultants. The test program was completed, but results will not be available for several weeks. The Conquest returned to Idlewild on Aug. 19, 20 after a stopover, fastest coming in a one-way trip.

Plane was fitted with 37 seats. New and standard first class configurations includes 66 headrest seats in a full load and an aft compartment, but three seats are removed to make room for flight recording instruments. Galleys and two lavatories are located forward, with two more lavatories aft. A new pressurized cargo compartment is located behind a rear cabin at the side of the cabin. Baggage compartments are under the cabin floor. Other standard configurations are 76 tourist and a second compartment of 45 tourist and 24 first class.

BOAC plans to operate the Conquest nonstop eastward and one-stop west bound on the North Atlantic. Some scheduling problems will apply to Pan American's 167-120. Pan American will

get long-range Boeing late next year, and BOAC will begin receiving its Boeing in 1960.

Tests of the Conquest IV for Air Registration Board certification are about 95% complete, according to Peter Bagg, de Havilland chief development pilot who flew as second pilot on the transatlantic trip. Remaining tests include 100 hr. of flying BOAC six routes, including the Far Eastern route.

First deliveries to BOAC originally were planned for Sept. 10, but now are expected earlier next month. One advantage BOAC has in the jet race is crew training accomplished with the

Conquest II, over a period of time. This includes a normal series of test deliveries on the Atlantic route with simulated landings at Idlewild and actual landings at other North American airports.

First deliveries to BOAC actually will be the final production Conquest IV. The de Havilland aircraft has, last week, won No. 1, and No. 2 in the present task.

Among the 22 points making test work's transatlantic trip was Fred Gervais, director of Rolls-Royce's flight development establishment under whose supervision for the Conquest IV's Avon RA7V engines were developed.

PanAm Plans Paris Airport Shift To Avoid Delaying Jetliner Service

Pan-Am American World Airways will have to temporarily shift its Paris terminal operation from Orly Airport to Le Bourget as a result of a Paris Airport Authority ruling that jet aircraft cannot land at Orly until major extension work is completed.

Extension work on the Orly and next summer must be completed with no less than Pan American expects to start North Atlantic jet service this fall. TWA, which its jet plans are still in liquidation, probably won't be affected by the ruling since its North Atlantic jet service will likely start after the Orly runway is ready.

Railair thus has two terminal sessions at Paris one for its jet service and one for its piston aircraft. Pan American already is planning to shift over to Le Bourget. Once Orly is ready, then Pan American will shift back.

The Orly jet ruling has made known recently when Paris Airport Authority opposed landings only at Le Bourget by now jet service operated by Aeroline

(AW Aug. 11, p. 31) and Garuda Indonesia Airlines C.S.A. Both lines are using Tu-104s. Aeroline Aug. 4 made its first commercial flight into Paris, flying from Moscow in 3 hr. 5 min. with 16 passengers and 450 lb. of cargo.

Rolls-Royce and C.S.A. are expected to follow a new procedure established by the Airport Authority which requires the approval at that only daytime take-offs and landings will be permitted and rapid clearance to 10,000 ft. must be requested immediately after takeoff. The Paris Airport Authority noted that the same regulations will apply to Pan American Boeing "707" aircraft when operating at Le Bourget.

Reason for the Orly ban is that the main runway, presently available for jet operations is north-south. But using this runway, Airport Authority, says, would require too abrupt flights over populated areas. Exhaust noise, being heightened to 10,000 ft., won't irritate. Flights over large population

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SHORTLINES

► **Allegheny Airlines** reports a new east-west traffic record during July with a total of 3,071,144 enroute passenger miles. The airline also has had a steady growth in enroute traffic which is up 20% over last year.

► **Canadian Air Transport Board** has established a new regulation requiring all non-scheduled air Canada air carriers licensed by the Board to fly into Canada to file annual reports on October 1 of each year. The reports must summarize flights and traffic carried into and out of Canada on such flights but does not specify how detailed the scheduled year reports must be.

► **Irish Air Lines** has opened a new office in Boston to handle passengers and traffic going in and out of that city when the Irish carrier begins scheduled service to Shannon and Dublin on Oct. 9. The office has facilities for sales, reservations and ticketing operations.

► **LAV**, the Vancouver station, carried 28,749 passengers on its routes between the U.S. and Vancouver during the first three months of 1958, a 15% increase over the same period of last year. LAV flew 5,246 passenger seatmiles and 11,701 tonmiles during the period as compared with a total of 17,980 passengers on the first quarter 1957.

► **Lufthansa West German Airlines** has announced that Rhein Main Airport at Frankfurt has been designated as the Federal Republic's first commercial jet airport. The field's main runway has been lengthened to 1,875 m. and perimeter air defenses to college camp facilities and new departure waiting room and arrival vestibule. Frankfurt was to become Europe's fourth busiest port of entry on Aug. 15.

► **Makruk Airlines** effective Aug. 15 have set up a new passenger handling unit at Makruk airport to expedite their reservations or acquire their tickets in advance. Aided at making passenger reservations, the new policy is a result of recent Civil Aeronautics Board approval expanding Makruk from the direct part No Show Control Plan which Makruk had voted against.

► **Compania Caliana de Aviacion** is increasing its Beirut-Buenos Aires route from two to four. First Caliana Boliviana is scheduled for delivery late this year, with the second two scheduled to arrive in the spring of 1959. Beirut and Caliana have agreed to form a joint carrier overland from Lima. Total seats for the full-time transport now stand at 76.

AIRLINE OBSERVER

► **American Airlines** is now thinking in terms of January for first jet service instead of late this year as previously announced. Later transport plan is set for the start of business delays, but of 70 more airline operators of the requirements of training and other pre-service activities.

► **American Airlines** will use the speed advantage of its Convair 440 jet transport (AW Aug. 4, p. 35) to try to capture a competitive lead in the New York-Los Angeles market. Carrier will inaugurate a "Blue Shell" non-stop service with the turboprop airline, which reportedly may have a 15 minute non-scheduled advantage over jet transport. American recently ordered 25 of the new rule design Convair for delivery in 1961-62.

► **Flight Safety** Foundation reports evidence of lower mental and physical stress on Civil Aeronautics Administration route operators working in traffic control. In an on-the-spot studies to establish criteria for traffic controllers, the foundation found that during an eight-hour period the average route operator drops from a position approximately 30 inches from the screen to one inch a few inches away as a result of fatigue. In studies at Chicago, Pittsburgh and Washington, operators were given physical examinations upon reporting and leaving duty shifts. During working hours, blood pressure readings were taken every 30 minutes in addition to finger temperature and rate of eye blinking, and photographs were made every 15 seconds to track dilation of the pupil of the eye.

► **Aviation** Rana's state-owned airline, is showing significant traffic gains according to Chief Air Marshal Zingales. Mumbai Zingales reported in January that the Soviet airline flew 67,672 more passengers and 25,375 more ton miles during the first half of 1958 than during the same period of 1957. Zingales also contends that the Tu-104 jet transport is an asset more than any other foreign plane, adding that the Soviet Union is willing to place the aircraft on a regular Moscow-London flight on an day acceptable to the British. British authorities, however, do not think it is questionable if the two governments will agree to the new airline which the Soviet Union through their promise to equip the jet aircraft with acceptable noise suppression.

► **Capital Airlines** has formed a special Cost Reduction Task Force in an effort to reduce heavy overhead costs on a minimum-scale basis. Meeting twice a week, the group is currently examining efficiency of the airline's general office departments in Washington before beginning a field investigation of station costs.

► **KLM Royal Dutch Airlines** is installing closed circuit television cameras in its new long-range jet based at Schiphol Airport, Amsterdam. Television is expected to solve problems encountered with limited visual observation of aircraft and during eight-hour camera test periods. Benefit will be used for motion picture in KLM's Rolls-Royce Dart engines used in the Vietnam Veterans and the Alton engines which power the 13 Lockheed Electra on order by the airline.

► **Boeing** is shipping more quantities of freight to its scientific stations on delivery air ports near the North Pole. Airline representatives of the Airports, according to a report in Inverness, have become so great the USSR plans to put new I-16 Midway and An-10 Uman long-range transports on this supply line before the end of the year. Soviet Pilot Stations 6 and 7 months, loaded over 100 metric tons of airfield cargo in less than a month.

► **Boeing** has received congressional approval for the granting of a structure extension of present airline passenger. Civil Aeronautics Board last October told airlines to tighten their passenger but suspended the rule four months later in the face of heavy opposition from the carriers and Sept. 1. CAB hoped for congressional action during this season on amendments to the Civil Aeronautics Act to reduce the cost, but has now adjusted the suspension order to Sept. 1, 1959.



ROLLS-ROYCE DEVELOPMENTS

Power growth of the Dart prop-jet

Dart prop-jets of 3,100 t.h.p. now being delivered, compared with the first production engines supplied in 1952, give—

- 36% more power for take-off
- 12% lower specific fuel consumption
- 12% higher power/weight ratio

During the five years since it entered airline service the overhaul life of the Dart has been raised as far as 1,900 hours.

Dart engines of 2,600 t.h.p. for delivery in 1960 will show the following improvements over the first production engines—

- 33% more power for take-off
- 18% lower specific fuel consumption
- 36% higher power/weight ratio

Work is in progress on versions of the Dart at higher powers and lower fuel consumptions, and a 25-hour test has already been successfully completed at a rating of 3,200 c.h.p. for take-off.

—another technical advance in

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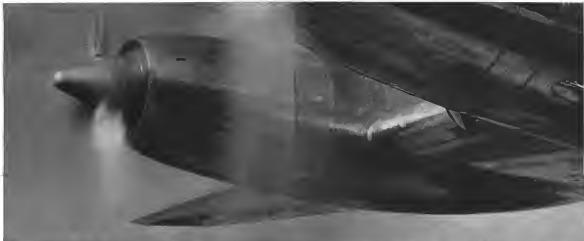
AERO ENGINES - MOTOR CARS - DIESEL AND PETROL ENGINES - ROCKET MOTORS - NUCLEAR PROPULSION

Airline Traffic - June, 1958

(IN MILLIONS)

	Revenue Passengers	Revenue Passenger Miles (RPM)	Load Factor %	U.S. Mail	Equipment	Flight	Total Revenue Passenger Miles (RPM)	% Revenue Available to Passenger
DOMESTIC TRAFFIC								
American	664,418	477,544	71.0	1,425,300	751,356	7,498,150	33,813,726	39.3
Boeing	291,168	244,020	83.8	384,476	142,175	1,057,476	5,384,481	49.8
Capital	249,756	146,493	58.7	234,447	276,157	1,017,109	14,407,890	49.7
Continental	74,343	37,399	47.8	37,023	143,426	5,413,376	5,413,376	100.0
Delta	836,561	713,181	84.6	314,849	385,143	97,283	17,435,416	53.4
Eastern	447,557	347,553	77.6	599,795	472,433	1,154,910	10,815,473	46.3
Northwest	152,432	43,511	28.5	311,232	47,239	684,215	7,284,144	46.3
Northwest	115,038	35,372	30.7	27,341	35,431	83,243	5,347,149	36.3
Northwest	148,516	114,861	77.4	445,733	267,297	713,171	12,367,776	51.7
Trans World	335,123	231,511	69.1	343,207	2,227,891	1,443,207	17,435,416	46.3
United	412,734	473,233	114.6	2,399,797	291,381	4,936,397	37,413,461	39.7
Western	56,191	30,574	54.4	104,239	25,823	3,217,410	5,911,193	46.9
INTERNATIONAL								
American	5,443	4,084	75.0	7,737	355	293,457	1,399,395	30.4
Boeing	2,124	2,111	99.4	4,134	4	82,134	844,844	49.8
Continental	36,833	1,313	3.6	1,073	3	137,363	137,363	100.0
Delta	4,571	4,571	100.0	7,144	1	39,449	739,449	49.7
Eastern	37,186	31,347	84.3	14,479	2	2,445,129	2,445,129	100.0
Northwest	7,433	1,494	20.1	4,138	5,599	1,433	322,433	28.6
Northwest	4,567	1,132	24.8	4,138	49,450	894,797	894,797	100.0
Northwest	12,112	34,571	28.6	1,955,855	12,144	452,119	5,336,307	47.7
Pan American	5,441	4,443	81.5	27,814	1	144,443	899,443	30.2
Alaska	120,443	121,443	100.9	1,011,779	3,229,379	17,307,343	17,307,343	100.0
Latin American	77,441	113,173	146.2	349,311	4,028,443	18,018,233	18,018,233	100.0
Pacific	22,443	22,443	100.0	971,712	1	1,438,443	1,438,443	100.0
Panagra	5,443	11,443	20.6	45,133	31,550	1,735,443	1,735,443	100.0
Trans World	3,443	3,443	100.0	1,011,779	3,229,379	17,307,343	17,307,343	100.0
Trans World	35,144	106,550	30.3	900,334	488,447	11,891,894	11,891,894	100.0
UNION	218	79	36.2	136,234	874	8,294	8,294	100.0
United	11,428	27,008	23.6	136,234	84,745	3,133,361	3,133,361	100.0
Western	768	1,041	13.5	447	3,074	393,361	393,361	100.0
LOCAL SERVICE								
Allegany	44,833	7,443	16.6	9,433	17,449	26,419	799,449	49.8
Boeing	14,781	5,441	36.8	4,239	2,390	8,531	263,441	49.8
Capital	11,734	2,111	18.0	2,144	3	137,363	137,363	100.0
Continental	30,443	4,238	13.9	17,443	3,241	25,443	497,443	36.3
Delta	11,714	2,443	20.8	4,443	12,443	1,894,779	1,894,779	100.0
Delta	27,474	2,443	8.9	4,443	12,443	1,894,779	1,894,779	100.0
Northwest	47,943	11,443	23.8	22,797	31,441	1,144,363	1,144,363	100.0
Northwest	14,443	4,138	28.6	4,138	15,443	10,547	1,144,363	47.7
Pacific	23,747	7,933	33.4	10,911	6,443	8,750	722,173	43.4
Panagra	27,443	2,143	7.8	16,410	12,441	13,443	702,443	59.1
Panagra	14,443	3,443	23.8	7,443	1,249	1,443	1,443	100.0
Trans World	19,443	4,391	22.6	15,443	7,143	1,443	461,363	26.3
West Coast	22,173	4,044	18.2	4,171	2,441	8,444	461,363	49.1
RAVIAIR								
Boeing	38,443	4,041	10.5	4,123	1	134,443	419,443	39.4
Trans World	38,443	4,041	10.5	4,123	1	134,443	419,443	39.4
CARGO LINES								
American	9,443	42,143	44.6	22,143	22,719	7,443	424,719	49.8
American	9,443	42,143	44.6	22,143	22,719	7,443	424,719	49.8
Boeing	4,443	22,143	50.0	14,443	14,443	1,443	1,443	100.0
Continental	4,443	22,143	50.0	14,443	14,443	1,443	1,443	100.0
Delta	4,443	22,143	50.0	14,443	14,443	1,443	1,443	100.0
RESCORTS LINES								
Boeing	9,443	144	1.5	1,347	1	17,443	17,443	100.0
Boeing	9,443	144	1.5	1,347	1	17,443	17,443	100.0
Boeing	9,443	144	1.5	1,347	1	17,443	17,443	100.0
ALASKA LINES								
American	4,443	5,441	12.2	15,441	305,714	26,474	26,474	100.0
Alaska	4,443	22,143	50.0	2,443	5,143	63,714	63,714	100.0
Continental	1,443	144	10.0	2,441	14,443	26,474	26,474	100.0
Delta	4,443	22,143	50.0	2,441	14,443	26,474	26,474	100.0
Northwest	2,443	744	30.4	22,443	26,474	174,714	174,714	100.0
Pacific	12,443	12,143	97.6	15,443	1,120	342,714	1,472,443	66.9
Trans World	2,443	5,143	20.9	26,474	121,474	294,714	294,714	100.0

* Not available. † Under Revision. ‡ Control Airways. Compiled by AVIATION WEEK from airline reports to the Civil Aeronautics Board.



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SPACE TECHNOLOGY

Soviets Report to IGY on Satellite Dog

Moscow—Details of biological experiments with Laika, the dog which lived for seven days aboard orbiting Sputnik II, were revealed by Russian scientists recently at an International Geophysical Year congress here.

Report on Laika indicated weightlessness need not be less of a problem in space than this was previously anticipated. One top Soviet scientist said he believed some could survive without ill effect even weightlessness encountered during a period of travel, at least in the moon.

The Laika paper was one of a number of reports on rocket and satellite programs exchanged by Soviet and American scientists at the congress, held to evaluate the first year of the 18-month IGY program. Privately, Soviet American scientists complained that the Russians were withholding basic data on Soviet satellites which American already have published on the U. S. Explorer and Vanguard projects.

Russians Withheld Data

Specifically mentioned was the lack of information on Russian orbital elements—a piece of information which would lead to comprehension of launching rates, which never have been announced by the Russians.

Americans attending the congress said, however, that their Soviet colleagues were both cooperative and honest in the exchange of most data. In addition to rockets and satellites, symposia and working meetings were held on such subjects as cosmographic cosmic rays, ionosphere radiation, geomagnetism and ionosphere.

Orbit data released on Soviet satellite programs included papers on solar batteries and cosmic radiation. American Robert Johnson of the Naval Research Laboratory, delivered a paper on the tracking of Sputnik II during its first days which showed the rocket wing traded in outer Mongolia. This was the young which Premier Nikita Khrushchev, with the backing of the Soviet Academy, charged landed in Alaska.

Laika Observed

Paper delivered by Soviet space biologist Vladimir Yandlovski, said observations at Laika showed Sputnik II could be a study of steady and continued effects of acceleration, noise and vibration as well as a prolonged state of dynamic weightlessness during orbiting. Yandlovski reports showed Laika was frightened during takeoff but Yandlovski

said the dog survived the entire experiment. After acceleration started, the rate of heartbeat increased by three times but this decreased to acceleration decreased.

Heartbeat is shown by electrocardiogram was as expected.

During weightlessness in orbit, movements of the animal became short and snatches and breathing became short and heart rate decreased to normal. However, the rate at which Laika's heartbeat decreased to a state of weightlessness was three times slower than had

being assumed from laboratory tests. Yandlovski suggested that this due to a negative state is maintained to normal weight in the laboratory.

Electroencephalogram showed state changes in heartbeat during initial stages of weightlessness but these were not pathological and soon disappeared. There were no causal changes in physiological functions due to weightlessness. The Soviet space biologist said blood circulation was normal.

After seven days Laika was killed by poison in a food bin at land. Yandlovski said. No attempt was made to trace the effect of cosmic radiation as Laika due to the impossibility of removing the body is added.

Yandlovski said the Russians hope to reestablish more experimental biological work on Laika. Sputniks to answer "in the very near future" some of the questions connected with the medical aspects of space flight.

The Soviets said during the congress that they are now at work on Sputnik IV which will be a "cosmic observation." This did not indicate but presumably this may be equipped with a telescope for viewing stars from above the earth's atmosphere with precision for a television video camera. American space reported they are planning to launch a satellite with an instrument package developed by Signal Engineering Laboratories with two infrared photoconductor telescopes.

Enabling Scanning

These will enable scanning of cloud masses, land and sea area. Light as traces of scanned space sections would be recorded on the satellite's tape recorder and transmitted continuously to permit reconstruction of a mosaic picture.

Rocket and satellite working schemes at the congress reached agreement on the need to avoid environmental contamination during exploration of space. Subsequently, the suggested that studies be undertaken of ways to set up traffic control of future satellite projects to avoid overcrowding of aircraft around the earth. One problem discussed was the need to design advanced satellites once their usefulness ended.

Presumably this would be done by a device to free them back into the earth's atmosphere where burn-up would occur.

Description of the death of Sputnik II was completed by Dr. Yuri Gagarin of the Southwestern Astrophysical Labo-



FIRST stage of Vanguard satellite vehicle is placed in test tower at the Martin Co.'s Baltimore plant for ground mission survey. Readout was only one used to record information through strain gauges and other devices. First stage is 44 ft. long.

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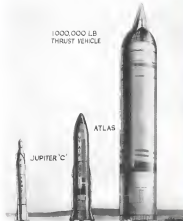


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tion from eyewitness reports. He described it as a "spectacular sight" with the glowing Sputnik shedding molten metal and trailing a tail of fire as it first plunged into the atmosphere off Barbados and British Guiana. No known data on this or the final date of Sputnik I have been given at the meeting. American scientists have criticized the lack of some Russian data in the fact that one critical fact has not been compiled and analyzed and also suggested the Russian tracking and reporting actual, may not be as efficient as the United States'. American scientists also showed some of the instrumentation aboard Sputnik III. This included an induction magnetometer used to measure rotating data on magnetic fields.

Televised records obtained from the astronaut also were shown but this data has not yet been interpreted. Americans described the magnetometer as a "fairly built instrument." They said it was larger and heavier than U.S. instruments of similar quality with no apparent effort to miniaturize it. Proposed for cooperation with the Russians and other nations on space flight projects was put forward at the IGY meeting. No action was taken on the proposal until a similar resolution was sent to be before the International Council of Scientific Groups but it raised the intriguing possibility that the case of the first lunar or space ship might be international in character if such agreement could be reached.

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THRUST VEHICLE



Million Pound Thrust Vehicle

Driving by Rocketdyne Division of North American Aviation shows imagination and use of rocket that could be boosted with a million pound thrust rocket. Rocketdyne has received a contract from Wright Air Development Center to build major components for a million pound thrust liquid propellant engine. Under separate contract, USAF has ordered Rocketdyne to develop its liquid in the near future stage between current production engines and a million pound thrust rocket. Work on an intermediate rocket has been under way at Rocketdyne since 1955. Both projects will be developed at the new Rocketdyne plant at Canoga Park, Calif. Intermediate and million pound thrust engines are designed to L and F-1 respectively by Rocketdyne.



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LEAR will construct model space vehicle capsule under WADC contract. Crew would enter control room (right) in descent chute.

Lear Studies Space Crew Controls

Genel Ruyeb, chief-lear, Inc. will study manned space vehicle flight crew requirements and construct a model crew capsule, including instrumentation and related flight controls, under a contract recently awarded by Wright Air Development Center's Flight Control Laboratory.

Now, progress is a space oriented one.

tion of the integrated whole panel flight instrument instrumentation for general aircraft which Lear recently completed for WADC's Flight Control Laboratory.

During the next 15 months, Lear engineers will visit all companies known to be working on space vehicle and space weapon programs to assist in de-

termining what sort of instrumentation and controls space travelers will require to perform their mission. Scope will include instrumentation required for navigation, orientation, propulsion, power generation and provision of individual environment within the vehicle. Engineering psychologist Dr. Malcolm J. Rutter and his associates will work with Lear engineers in determining crew requirements. Part of their task will be to determine which func-

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Guidance Tests

Guidance and control action of U.S. Army's Jupiter C four stage missile is tested in Andrew Austin and Kenneth Johnson at Army Ballistic Missile Agency, Huntsville, Ala.

tests should be performed automatically, when an error left in the run.

Four says that specific reasons for the crew space capsule is not yet critical. It may be for an orbit around space vehicle in the launch and received from a space station or for a vehicle capable of taking off and landing on a planet. Program will be conducted by Lunar Advanced Program in Division in Ground Launch.

North American Gets Space Particle Study

Los Angeles—North American Aviation, Missile Division has been awarded two U.S. Army research contracts through Los Angeles Ordnance District. One contract is for laboratory study in which atomic particles resembling ionospheric particles in outer space will be blasted against various materials to determine impact effects. Other contract involves of various materials and high temperature ionization lenses.

which one knows what the little box is for?



Box iters, because you take the little black box one of and the big black box. It's a miniature high-speed electromechanical unit will operate precisely former sampling up to 35 thousand as in the levels of speeds up to 2500 samples per second. Weighing considerably less than a pound and occupying less than 20 cubic inches, this new achievement of the Wanco Engineering Company is ideal for telepresence applications under severe environmental conditions. High accurate output accuracy long life and reliability exceeding capability, and a great variety of output speeds are all inherent characteristics of this small package. The Wanco reputation for reliability and accuracy is contained in this little box with some pretty advanced engineering.

Of course, you know this all along, but if you'd like to know more, there is a brand new Bulletin, Number 102, that is yours for the asking.



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SEE US AT WESCON SHOW #101



FIRST Boeing Bomarc surface-to-air intercept missile is readied for shipment to Air Proving Ground Center, Eglin AFB, Fla.

USAF's Bomarc Readied for Shipment to



COL. R. J. Walling, USAF plant superintendent at Boeing (right), and Louis A. Wood, Boeing vice president and general manager of the Phoenix Aircraft Division, inspect Bomarc.

Boeing Bomarc IM-99A surface-to-air intercept missile, which will be tested at Air Proving Ground Center inside range, Eglin AFB, Fla., is ground-tested at plant and components are broken down for separate shipment. USAF missile contracts, in order of contract as a possible NAAD within zero defense contracts (AW Aug. 4, p. 62) and also is involved in Department of Defense contractor involving a selection between Boeing and Aero's Nike Heron (AW Aug. 11, p. 71).

Bomarc has a range of about 200 mi and is controlled by SAGE (Semi-Automatic Ground Environment) system with missile's homing radar locks on target and takes over guidance. Test ranges under construction, will cost about \$420 million, including costs of Bomarc which will be used there. Range extends northwest about 150 mi into the Gulf of Mexico, is about 150 mi wide and will be operational from Santa Rosa Island in next summer. Missiles are assembled at Eglin's Herbert Todd, then shipped to Santa Rosa Island.

MISSILE ENGINEERING



BOMARC missile (left) will complement the General F-102 interceptor in North American Air Defense Command operations.

Eglin Range

Range stations are being built at Eglin, Cape San Blas and Andros near Tampa Springs Fla. Santa Rosa base includes fuel storage, ship, support operations center, first and power plant and other support installations. Cost of Bomarc support buildings at Santa Rosa Island and Herbert Todd is about \$4.1 million. Missile delivery is to 4751st Air Defense Missile Wing.

Super Bomarc IM-99B, slated for operational use in 1960, will have a solid-fuel motor casing. This is a period to increase Bomarc's range to 400 mi. IM-99A booster is Aerojet-General liquid propellant motor, was tested as part of Marquardt K13 Mk 3 engines. Missile is designed for Mach 2.5 speed at a cruise altitude of about 60,000 ft. Ground environment and support equipment will be common to both IM-99A and the Super Bomarc Bomarc is 47 ft. 4 in. long. Chopped eight planform wingspan is 33 ft. 2 in. Main body shell is 35 in. dia. Missile was wingtip aircrew for roll control and banking turns.



BOEING IM-99 BOMARC INTERCEPTOR MISSILE



WASHNET, aluminum, stainless steel and fiber glass are used in fabrication of Bomarc.



One Pound Lighter— 10 Miles Farther

The problem is—how do you get them lighter?

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In the previous years Honeywell has been developing and producing airborne control systems, miniaturization techniques have received surprising attention. Special packaging and quality control techniques have been developed. Laboratory control methods have been applied to production lines to achieve desired product uniformity and quality.

One recent miniaturization achievement at Honeywell is the famous Great Gyro—a complete flight control rate gyro weighing only 1.6 ounces. Another, the new Honeywell Miniature Inte-

grating Gyro (MIG) weighs only 8 ounces. The gyro II replaces weights 193 ounces—a 92% reduction!

In a completely different area, Honeywell has developed a Transistor Power Converter, the size of a candy bar, and weighing 12.4 ounces. It reduces dynamos five times as large, weighing 6 pounds—yet it delivers the same performance in transforming one DC voltage to another.

Miniaturization is another area where Honeywell's accomplishments make it a logical choice for further weapon systems development and production. If you have a problem in the design of systems or components for aerospace control, call or write Honeywell, Military Products Group, 2750 Fourth Avenue, South, Minneapolis 8, Minnesota.

Honeywell

 Military Products Group



Real Gyro—Flight
control rate gyro
wt. 193 ounces



MIG Gyro—Miniature Integrating Gyro
wt. 8 ounces



"Candy Bar" Converter—Transistorized Power converter
wt. 12.4 ounces

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This nuclear-armed "barr" is the aerospace missile with which the U.S. can retaliate against the toughest of enemy targets — distant, hard-to-hit military installations.

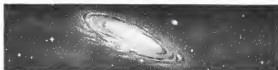
Chance Vought's Regulus II provides the extra margin of accuracy that enables the Navy to zero in on such "small" — and deadly — strongholds as H-bomb warehouses, submarine pens, ballistic missile bases.

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In production now, Regulus II provides double deterrence — the power to help forestall nuclear war — pinpoint accuracy to deter localized trouble.

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Vought's rapid advance into new weapon areas is the natural outcome of 40 years of successful aircraft design and manufacture. A pioneer in the missile field, Vought's Regulus II has been operational since 1955. The sub-sonic Regulus II is now in production. The record-setting Mach 2.4 Crusader was the predecessor of the all-weather subsonic fighter, Crusader III, which made its first flight this spring. Vought is currently working on the Dyna Star project as a member of the Boeing space plane development team.

Today at Chance Vought, development work goes on into virtually every known dimension of weapon systems.

ANTISUBMARINE WARFARE (ASW)

Vought is engaged in ASW studies within the Office of Naval Research and the Bureau of Naval Weapons. Extensive research and development is being done in the vital detection and classification phases. Goal is to bring down the threat of submarine capabilities.

Vought applies to the work a pre-eminent background in integrating

number 10 years' experience in installing, testing, observing Regulus First missile, an intimate knowledge of submarines.

ASTRONAUTICS

Vought is actively studying space research vehicles. Projections of this work point to even in space. Vought's Astronautics strength is experiencing rapid growth: up to a 50-fold increase in less than two years in some groups. Through this astronautics nucleus, Vought reveals the space capability of its entire engineering organization.

Vought's major contribution to U. S. man-in-space technology is a rich source of concepts and capable knowledge.

WEAPON SYSTEMS PLANNING, ANALYSIS

This body of Vought specialists is determining future weapon requirements, defining new areas for close evaluation. Under way are studies of nuclear-powered missiles and other unusual applications for today's explosion of propulsion possibilities.

In this area, breakthroughs already have been scored in antenna design, high-speed automated test control for speed of flight, and in controls and hydraulics.



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tion gear was shown to Aviation Week.

Hubert pointed out several similarities the company had shared out with the helicopter rotor transmission configuration but with the H-type transmission layout. The configuration:

- Minimized weight penalty of its square shaft. Its relationship between rotor diameter and weight. Two small rotors can operate with lower shaft loadings than possible with an equivalent single rotor, which means vibration levels.
- Increased the center of gravity since it's not so far from the rotor hub as possible with a single rotor configuration in many rotor thrust differentials. As a result, rotorcrafts are less likely to fight through in landing.
- Greater efficiency in terms of as power is needed to drive a torque reaction motor. Electric advantages claimed by the H-type transmission include:
 - Lower loading stresses in the engine because most of the engine transmission and fuel weight is located directly under the two rotors.
 - Lower drag loading.
 - Maximum efficiency of loading between rotors. Clear rotor length is 24 ft in a loading length of 14 ft. 4 in. in loading has an oval section approximately 5 ft square.
 - Shaded possible drive shafts between rotors and engine.

Arrangement of undercarriage loading and the elimination of flight vehicles was a first requirement of full helicopter operation. Hubert told us to return to the main rotor and was worth explaining on that consideration alone.

Synchronizing Shaft

The H configuration calls for a long horizontal synchronizing shaft to couple the two rotors in phase and to keep the two rotors in the event of one engine failure. In this condition the 50 ft long shaft has to transmit 500 hp maximum but in normal operation the shaft is only lightly loaded with the torque differential between the two rotors. Initial engineers have reduced the weight of the shaft by stepping up the speed to 1,920 rpm using a belt of 30 teeth per minute inside strength steel with 2 in. OD and 3 in. ID which is polished outside and heat-treated inside, to improve the fatigue life and to help bonding the main bearing races to the tubes. To meet the winding condition, the shaft is mounted from 10 ft up with bearings. A second method of mounting the bearings, which the weight of the shaft. It eliminates the need for welded or riveted joints along the tube and enables the bearings to accommodate deflections of the shaft due to winding of the tube.

Boeing's chief helicopter pilot, C. J.

Soviet Atomic Phase?

Vladimir Voznesenskiy, a daily newspaper published in the Communist East German city of Berlin, reports that the Soviet Union already has built an atomic-powered aircraft. In an article published under the title "Atomic Energy and Transportation," the newspaper said: "In the Soviet Union, the first atomic-powered airplane has been built. In principle, it is in a place in which the air is not so thick as in the atmosphere at approximately 10,000 ft. Thus, a higher discharge volume is achieved. Reduction possibilities in its provided by a new light alloy developed in Soviet conditions."

D. (San) Flanagan, told Aviation Week that the existing tests had given engineers with adequate static testing of the aircraft, which could have led to ground resonance, caused some slight shifts.

The aircraft was flown at 10,000 ft below 10 ft within the ground carbon. Tests included turns through 300 deg in both directions and redshifts measured in both directions. Maximum forward speed of 30 kt was achieved.

Response to the shroud, Helicopter said, was extremely good. Control was light and there was no visible vibration at vibration levels in the fuselage and particularly on the controls compared with the 171 gyroscopic version.

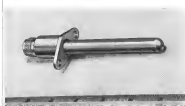
The rotor hub and the central control version are distinguishing features of all Federal helicopters. The blades are connected to the hub by a gear system. The rotor hub is attached to the blade in a way to rotate on the inner one, bearing loads being taken by a pair of needle roller bearings. But the centrifugal load is caused by a fan that rotates the set of heavily loaded thrust bearings and reduces the control forces needed to twist the blade. The rotor is forced from a cluster of four to reduce the mechanical stiffness and to give added safety in the event of malfunctioning of teeth.

Apart from the work to get the rotor, the vibration and transmission of the 171 follow closely that of the previous 171 series. The rotor, which first flew in 1972, was underpowered and had three-bladed rotors (they four blades).

Principal modifications to the 171 transmission include mounting the hub from negative differential places to lower the center of gravity of the fuselage in order to overcome the loading and rolling moments. Height of the rotor rotor above the lower rotor has also been increased to reduce interference between the two rotors at low forward

New Thermocouple Measures Up To 3600°F. Without Water or Air Cooling

Designed For Jet Engine Afterburners, Ramjet and Rocket Exhausts



A new, high-temperature thermocouple probe, developed by Thermo Electric, promises to solve serious sensor problems of turbine or test stand temperature measurement. This probe was designed for use in the high velocity gas streams of jet engine afterburners, and ramjet and rocket exhausts. The key to its performance is a ceramic (non-metallic) construction support tube and reduction shield.

This support tube replaces the need for water or air cooling. At a direct result, conduction errors due to cooling are eliminated and radiation losses to cold draft walls are reduced about 60%. Other disadvantages of water cooling—water supply, condensation, additional space needs, and other installation difficulties, are also eliminated. Equally important are the probe's construction—Thermo Electric's Rhodium/Rhodium 95% Rhodium up to 3000°F. and Inconel/Rhodium up to 3600°F. Thermo Electric's initial objective with this probe was a life in excess of five years at temperatures of 3000°F. or higher. It has already been tested at 3000°F. in a Mach 1 gas stream for 15 hours without failure. Tests are still under way to determine the ultimate operating limitations of the probe's structural elements.

Other Applications

Possible applications of this type of unit, however, are much wider in scope. Both construction and construction can be varied to meet a great variety of temperature measuring problems. The support tube itself, for example, can be formed to almost any shape. Other tube materials are also being investigated.

If you'd like further information on this thermocouple and how it can be adapted to your particular needs, contact Thermo Electric. Its development is typical of T.E.'s continuous progress in the field of high temperature measurement. Our extensive research and engineering facilities provide a complete service for the aircraft industry. Call us on. The answer to your problem may be waiting for you.

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Model C-100 strain gage amplifier



Model C-100 strain gage amplifier

For complete data, write to

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385 Completes Test

General Electric's B17 jet turbine engine has just passed its 15 hr performance flight testing test qualifying it for production use. General Electric says the B17 is in the 1,800 lb thrust class, making it an Aurora West engine (AV Week 1, p. 210).

Applicants for the B17 include the Northrop T-38 trainer, North American F-105 fighter, and the B-1 bomber. GE's B17 is also under development for the McDonnell Douglas F-4 Phantom II.

speeds where it reached a peak. First turbines in this configuration take down but have not yet exceeding difficult throttle control of the new engine.

Replacement of the piston engine by the Napier Gnome has power to the engine's output for no more change in the transmission layout. Main advantage of turbines which Hufner noted, apart from the big cut in weight in specific engine plus fuel weight, was the ability to inspect the engine. This permits a constant worldwide performance inspection of height or temperature variations. It was of primary importance in helicopter operation. Hufner said.

Elimination of cooling fans and starting clutches are other weight-saving features of the new power source and due to smoother torque characteristics there is no need to protect the transmission from peak torque increases which had developed in the piston engine configuration.

BEA Free to Buy De Havilland 121s

London—British government has approved British European Airways proposal to purchase 21 de Havilland DH 121 jet aircraft from a consortium of firms in Aircraft Manufacturing Co. (Amco).

David Workman, Minister of Transport and Civil Aviation, says the aircraft will cost \$42 million and will be delivered between 1964 and 1966.

Conditional approval of the contract was given in February (AV Week 17, p. 41). Amco, consisting of de Havilland, Farnley and Hawker Aircraft, was formed at the end of last year as a successful effort to get the BEA contract.

While BEA announced specifications for a medium-range jet aircraft in August 1962, four companies submitted proposals. But the government, unconvinced of any one company's ability to meet the requirements within BEA's schedule, and the order would go to the company that "proved its resources with others" and gave



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Write to: Mr. A.H. Stevenson, Engineering Personnel, North American Aviation, Inc., Los Angeles 45, California.

THE LOS ANGELES DIVISION OF
**NORTH
AMERICAN
AVIATION, INC.**



and complete engine assembly. Also now complete to build de Havilland's DH 121, while British Aircraft Co. and Hawker Aircraft announced a joint proposal to build British's 100-seat transport jet.

The government finally chose the DH 121—BEA's original preference. A contract will be signed when detailed designs have been submitted to BEA, Amco says.

British Test Visual Glidepath System

London—Visual glidepath system developed by Royal Aircraft Establishment at Farnborough is being installed for operational evaluation at five airfields of the Ministry of Transport and Civil Aviation.

System consists of two pairs of axially arranged to form lighted runway on both sides of the runway. First pair is located 500 ft along the runway from the threshold and the second pair 1,000 ft further out, indicating track-down area.

Units are flat rectangular boxes projecting light toward the approach runway in 4 ft by 10 ft units. Each unit is angled so that the light is 8 ft in front of the runway edge.

Optical system projects white light over the upper sector, and light over the lower sector, with a gradual change of color over a half-degree sector. Emission of the system is about 100 ft below the horizon. It is set for the aircraft's normal descent path.

In making an approach, the pilot should be able to see the white light at the lower angles (to avoid under-shooting) and the red light at the upper angles (to avoid over-shooting).

One system has already been installed at Blackbushe, Hampshire, and others are being installed at other airfields. Others are being installed at Aberdeen, Belfast, Liverpool and Prestwick.

Vickers Vanguard Structure Modified

London—Local stiffening of the Vickers Vanguard wing, chassis and landing gear to accommodate an extra 4,000 lb payload, at the expense of some weight loss, will be done on the Vickers Vanguard aircraft.

Structural modifications will be incorporated in the first 11 aircraft off the line. Using a 119-400 lb high density alloy, the new Vanguard will cost about \$1.5 million.

will drop to two costs per passenger outside one stage in short at 100 mph and to one cost on distances exceeding 500 mph, according to Vickers.

Weight modifications in the high density alloy fuselage will cut a weight of 16 in and save in weight. The current version costs \$7.5 million.

Maximum takeoff weight of the new Vanguard version will be 141,000 lb. The maximum landing weight is 117,000 lb. The maximum wing load is 117,000 lb. The maximum wing load is 117,000 lb.

Principal engine modification to accommodate the extra payload is the addition of the engine. The engine is a 1,000 hp engine.

Company also worked plans for an all light version incorporating the modifications. Maximum takeoff weight of 130,000 lb is envisaged with a 100,000 lb payload. This of the new version will be strengthened, larger doors will be fitted and there will be no cabin windows. Provision for an air conditioning will be incorporated but the basic equipment carried on the passenger version will be fitted.

The Vanguard is expected to make its maiden flight in November.

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- ☐ Automotive problems design programming
- ☐ Mathematical and scientific research and problem solving
- ☐ Product or equipment evaluation
- ☐ Other (please describe)

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AVIONICS



MAJOR step in the Civil Aeronautics Administration's avionics procurement program for the next five years will be long range air route surveillance radar (ARSR), left, and Victor stations, right, which provide a combination of VOR and Victor navigation services.

CAA Plans \$5 Billion Avionic Spending

By Philip J. Klass

Washington—Current expansion of federal avionics facilities has thrust Civil Aeronautics Administration into the position of being the nation's second largest buyer of avionics equipment just behind the Defense Department. CAA is likely to hold this position for at least the next five years with projected expenditures of more than a billion dollars during this period, more than half of which will go to buy new avionics equipment.

During the coming year, CAA expects to spend 35 million plus for replacement avionics tools—no much as the agency received from Congress for procurement of new avionics facilities five years ago. The \$175 million which CAA has been authorized to spend in fiscal 1959 for construction of new facilities and modernization of existing facilities is an increase of approximately 35% from last year. Corresponding figure projected by CAA for fiscal 1960 is \$251.5 million, a 16% increase above the current year. In fiscal 1961, CAA's projected figure begins to taper off, but still shows slight.

However, these projections do not include provisions for buying new automatic traffic control data processing systems or automatic ground-air-ground communication systems (AGACS) which the Federal Aviation Administration Board on Air Traffic Development. If these programs proceed according to schedule, they should be ready for initial production by 1961-62. The model time is likely to be in CAA expenditures in-

stead of a single drop-off. In fiscal 1959, CAA awarded 524 contracts, of more than 5500, more than twice the previous year's figure. Estimated for coming year is around 1,000.

Slightly more than 20% of the above figure represents CAA buying of equipment and hardware from avionics manufacturers. Balance includes cost of constructing facilities, such as Victor stations, to house and utilize the equipment. Here, for example, is a breakdown of fiscal 1959 avionics procurement:

- Radar \$39.6 million
 - Communications \$16.0 million
 - Navigation aids \$43.5 million
- The foregoing figures, which total \$99.2 million, would be slightly larger if Congress had not authorized CAA to buy some of its fiscal 1959 needs in the coming months of fiscal 1959.

Cost of buying and making new Victor stations and converting existing

VORs to Victor is the largest single item in the fiscal 1959 program and is likely to become the largest during the next five years except for fiscal 1960 when it is shaded slightly by long-range air route surveillance radar. Another major item will be the building of ILS environment approach systems with distance measuring portion of Victor to provide what is called "ILS-TAC."

Modernization of existing CAA avionics facilities provides an attractive business potential. For example, Victor Instruments was recently awarded a \$2.4 million contract to modify existing airport non-precision aids to provide for longer, larger, and more modern modern performance monitoring.

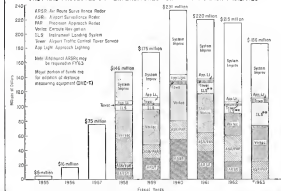
As a government agency, CAA procurement is subject to some of the same general rules as those of the military services, but with two important differences that concern buying contracts having same avionics manufacturers.

- Competitive bidding. Great bulk of CAA's buying is awarded on the basis of the lowest qualified bidder, whereas much of the military services buying is on a negotiated basis where price was not the sole criteria.
 - Legitimated damage. Payments all of CAA's contracts contain legitimated damage clause for delay in delivery. Payment of damages runs about 0.1% of equipment's price per calendar day of delay. Thus the contractor stands to lose all or most of his profit if he is 40-60 days late in delivery.
- Avionics manufacturers naturally would prefer to take jobs without legi-

CAA Operating Costs Up

Dynamic increase in CAA procurement of new air navigation facilities will be reflected in increase in number of persons needed to operate and maintain these facilities, and corresponding increase in annual CAA operating costs. The 25,211 people assigned to operation and maintenance in FY 1959 are expected to grow to 35,661 by FY 1963, and annual operating maintenance costs for same period are expected to jump from \$249.9 million to \$403.5 million in FY 1963.

PAST AND PROJECTED CAA EXPENDITURES FOR AIR NAVIGATION FACILITIES



ESTABLISHMENT OF AIR NAVIGATION FACILITIES IMPLEMENTATION SCHEDULE FOR FISCAL YEARS 1959-1963

FACILITIES OR SERVICES	Total Quantity		FY 1959		FY 1960		FY 1961		FY 1962		FY 1963	
	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost
1. Long Range Radar System (ARSR) - 100												

NEW



NEW TYPE 6 SERVO MOTORS

Here's one of the smallest precision servo motor series currently available. The new Daystrom Transcoil Type 6 Motors are wound for 28-, 32-, and 52-volt operation. Control phase is center tapped for operation with transistor drive. These Motors develop 120 oz-in. min. stall torque and 6500 RPM free speed. Each unit weighs only 9 oz. and is less than 1 1/2" overall.



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NEW TYPE 8 SYNCHRO

The new Daystrom Transcoil Type 8 Synchro Line consists of transmitters, control transformers, differentials and receptors. Dimensions equal to BuGrid Size 8. Operation: 115V 400 cycles or 26V 400 cycles. Accuracy of ± 10 minutes is standard. Other accuracies are available upon request. Corrosion resistant construction throughout. Conforms to MIL-E-8812-A. Operating temperature range is -54C to +125C. Higher temperature units also available.



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direct damages. Recently formed Electronic Industries Association (EIA) committee on CAA procurement patterns has approached CAA to ask that liquidated damages clause be dropped, or that at least a maximum limit be set on amount of damages.

But CAA is "now later, never dry" on the subject. In 1950, CAA dropped use of liquidated damages clause when industry claimed that it did not achieve the desired effect of accelerating delivery. Shock absorbed the Korean war broke out and industry was delayed with military business. Many companies adopted their existing CAA contracts to a low-priority status with newly available funds for the agency.

For example, one manufacturer was late some time in delivering VOR equipment. Another was late some time in delivering position approach radar and four years late in delivering direction finding antenna, according to CAA figures.

Following extensive analysis of contractor performance, CAA decided in the fall of 1955 to re-examine liquidated damages provisions in future contracts, although its view indicated that "a seriously curtailed" CAA inspection procedures and change orders contributed to delivery delays in some instances.

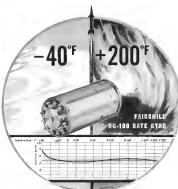
Delays Slashed

Since the liquidated damages clause went into use, CAA feels that contractor performance has improved significantly. How much of this improvement can be attributed to the damages provision and how much is due to easing of defense workload and the keen competition within the services industry which took place about the same time is debatable.

Of approximately 700 major contracts awarded during Fiscal 1957-1958, nearly 500 have been completed and payable. All of the rest are on an annual schedule, with only a few stragglers of one consequence, according to Joseph Tippet, director of Office of Air Navigation Facilities.

Based on previous CAA experience, it appears that the EIA committee will have a tough time convincing the agency to drop its liquidated damages clause, particularly since there appear to be no lack of industry bids for CAA business.

Taking time, EIA will seek to set a maximum figure on damages—perhaps limiting them to total price of contract. Although CAA has no desire to involve financial companies in a possibly delinquent contractor, there is some question whether it can legally set a maximum limit on damages. If the government suffers damage because of late delivery, there is no legal reason why damages shouldn't cover a loss. That



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regard the amount of the contract or other predetermined value.

Manufacturers who hope to be low bidders for CAA business must really sharpen their swords and direct precisely those of the toughest competition for contracts come from newcomers who have failed to read CAA specifications carefully enough, or who have not heard about the thoroughness of CAA requirements. For example, bidders, the price of getting an education can run high.

CAA is not bound to accept a low bid if the agency determines that a bid is not qualified for the job. Before awarding contract to a newcomer, agency normally would have to evaluate company's facilities, and personnel according to Lewis Time general services office. But it is not always easy to draw the line between competence and incompetence.

Some manufacturers on first CAA should automatically suspect competence of new company that submits a bid which is far below that of known competent producers and/or former suppliers of the same item. Thus, they may indicate lack of understanding of the job to be done.

One company cites the example of a recent CAA competition where the price submitted by the low-bidder, a newcomer, was considerably less than half the figure quoted by a company which had previously produced the device for CAA. Spokesman for the latter firm told Aviation Week that one of just his new systems and tooling worth equal price quoted by winning bidder.

Buying in

But sometimes a manufacturer wins through underbids his estimated cost with the view to buying into a new field of future business. This can prove to be a short-sighted policy if another company buys its bid and the price idea is the most pronounced.

There may be other motivating circumstances. For example, when CAA questioned a company recently about its extremely low bid figure, company said it expected to submit a low, but wanted to keep its hopes anchored so it could bid for forthcoming defense business opportunities it hoped to make a profit.

Newcomers who wish to develop their own figures prior to bidding with the price paid by CAA to finance production of same or similar equipment can obtain such prices from the agency, upon request. But not too many companies do so.

Although CAA now has far more funds than in former years, it has a large job to accomplish. The agency therefore is not unhappy when competitors focus prices down, making it to stretch its budget.

For example, less than two years ago, CAA paid approximately \$7,000 for a

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SPACE NAVIGATION IS 12 YRS. OLD AT AUTONETICS

When mankind left its Earthly systems and set its sights on the vastness of intergalactic space, navigation problems seemed insurmountable. The answer was flying with the aid of Force Autometrics. As part of a team helping both the defense and civilian state of development, Autometrics led America's first successful flight test of an inertial guidance system. In 1960, when they flew their first flight, they demonstrated the feasibility of a self-contained guidance system. Today Autometrics has the basic knowledge and technology to develop the space navigation.

Autometrics

711 LSA engine-driven generator used to provide power at remote sites. Last year the low bid for such generators had dropped to \$5,200, and only last month the winning bid was only \$4,200, according to Raymond Miles, chief of procurement division.

Statutes for which designers formerly paid \$500, were bid at around \$180 as a recent comparison.

Critics say that CAA's procurement and inspection policies have slowed many previous innovations on doing business with the agency, forcing it to turn to new and inexperienced sources.

For example, three cities paid to reconstruct CAA's procurement of ASR-4 airport surveillance radar. None of the three companies that built the earlier ASR-1, -2, and -3 was (GARMA, General Electric, Bendix Radio) even subcontracted bids for the ASR-4. The winner, Texas Instruments, has never produced ground-based radar, although it has a long record of producing airborne radar for the Defense Department.

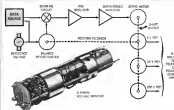
All three of the previous ASR projects are believed to have lost money on their former contracts, and at least one is somewhat bitter about CAA's situation. One contractor refused to accept company's missing target indication (MTI) because he and the wrong one shipped and installed equipment, and for another approach, spokeswoman told Aviation Week. Company says it worked together that MTI would not function properly if it were as he requested, but engineers now believe. When a second unit failed to function properly, company had to return again in original configuration, but was still



Improved Sextant

Improved perspective sextant developed by Kollsman projects aircraft scale into operator's field of view, providing faster, more accurate celestial fixes. New Type ADH-90 production-model perspective sextant will be used by Pan American World Airways and Qantas on new jetliners. Kollsman also has accurate brightness of artificial horizon reference to prevent motion's sea-sickness during flight tests.

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THE PRECISION VOLTAGE MONITOR is a variation of a signal system signal so that data related to the instrument or monitoring system is first susceptible to system errors. And designed for incorporation in the advanced telemetry system of Chance Vought's Republic 11 results in transmitted data with approximately 0.04% error rate. That figure is obtained by the inclusion of the effects of all and over the use of such as hydraulic, thermal, temperature effects, and long term drift, as well as telemetry system noise.

A VOLTAGE MONITOR CONVERTS analog signals from a voltage data source into 3 DC voltages, representing the data in four or more significant figures. These three accurate levels of information are fed into the telemetry or recording system as three separate channels. The result is transmitted information with an accuracy of less than 0.035%.

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Microwave Breakthrough

Chicago-Technology breakthrough in microwave tubes which could greatly increase range of jet-aircraft missile only warning surface and require space into installation, has been reported by Zenith Radio Corp. researchers. Tube which operates at entirely new principle, has same size of 1.4 ft., only broken in that comparable with other microwave tubes. Finest models exhibit 30 db gain, a bandwidth of 195 and appear suitable for use over frequency range of 100 mc. to several thousand mc.

considered for the additional cost. Another product of navigation equipment for CNA reports that experts found it to be desirable equipment upon which, when the device the shade of one was slightly off line.

CNA officials concede that some of agency's field inspectors may occasionally be in violation in testing to protect the government's right under a contract. Experts admit that there is occasional misunderstanding on the interpretation of contract terms in field inspectors, but say that he receives far more accurate data than a few years ago. Agency officials say that contractors are encouraged to bring such problems to them without fear of reprisal.

In short, CNA equipment government is set on a fixed price basis because they involve no development, only production. In practice, many programs under considerable development, construction.

This development area because CNA engineers tend to ignore the accuracy and performance of new equipment are their predecessors. Calling for a 25% increase in accuracy of a VOR, for example, may be a desirable and profitable objective, especially since. But a change of this nature which appears insignificant on actual system considerable development by the contractor. This frequently delays contracts delivery of the final article, as well as increasing his costs. Some contractors believe that CNA could also begin to change from previous design by substituting such changes in its own specifications, or otherwise flagging them. This would be, at some level, but obviously would not prevent an independent line from eventually getting what is needed in achieving the required performance.

Whether the rule and rules of doing business with CNA are in some way better, suggest the precise meaning of accuracy manufacturing suggests, coupled with the amount of CNA government funds suggest that industry will adjust, much as it has to the problem of doing business with the Defense Department and unpredictable private contractors.

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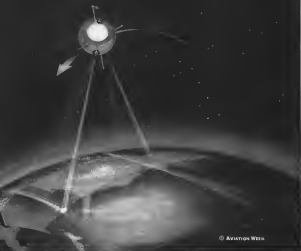
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WEATHER EYE infrared reconnaissance system is depicted mounted in a 20-in. Vanguard earth satellite. At an altitude of 300 mi—the one degree beam of the system would cover an area of 640 sq. mi. along the line of the orbit that depicts in this view, at a distance of 300 mi. to the left or right, and 1000 mi. in the horizon. Detectors are mounted at 45 deg. angle from spin axis.

U.S. Designs Infrared-Scanner Satellite

By JAMES A. FINCH

New York—Next U.S. satellite will be instrumental for infrared reconnaissance of the earth's cloud cover to gain meteorological information as part of the country's contribution to the International Geophysical Year. Successful orbiting of this vehicle will bring into being reconnaissance satellites one step closer to reality.

Both of the next two Vanguard satellites to be launched will be 28-in. 21-lb. spherical vehicles equipped with a relatively simple infrared scanning system called "Weather Eye," designed for the Vanguard program by the Space Research Instruments Division, Applied Physics Division, U.S. Army Signal Corps Laboratories.

Optical systems for two additional satellites have been delivered to the Jet Propulsion Laboratory by Perkin-Elmer Corp., Norwalk, Conn., which developed the optical systems for the Signal Corps. They will be used on the Army's Explorer satellite program. Next Explorer to be launched also will be instrumental for infrared reconnaissance.

System Operation

As designed by the Signal Corps, Weather Eye satellites will employ two infrared detectors to scan a path about 640 sq. mi. wide as they fly over the earth in orbits that will fall between 35 deg. north and 35 deg. south latitude. Pergees will be about 300 mi. and apogees about 1,000 mi.

The infrared reconnaissance has been kept relatively simple by the technique of using beam-scanned optics and spinning the satellite to obtain a scanning action. Satellite will spin at roughly one revolution per second with the spin axis lying along the line of the orbit.

To be sure that at least one of the two detectors will be observing the earth as it spins, the two are mounted diametrically opposite and aimed at an angle of 45 deg. from the spin axis so that one optic scans 45 deg. ahead of the satellite and the other 45 deg. behind.

Beams of the two detectors optical systems cover a total angle of about one degree. Because they maintain a fixed angle relative to the spin axis,

information as to orientation of the spin axis can be obtained by measuring and comparing the lengths of pulses from the detectors as they sweep from horizon to horizon.

Finally, what the detectors will see will be slightly reflected from the earth and its cloud cover. Intensities of the light reflected from the different areas will differ appreciably: 80% from cloud areas, 15-18% from land areas, and 5% from the oceans. Therefore, signals from the detectors telescoped to the ground will paint out a picture of the earth below the satellite as it orbits in its orbit.

Significance of Results

Weather information obtained from these first reconnaissance satellites will be limited to observation of cloud masses, their distribution and masses. Significance of this information lies in the fact that clouds are the visible signs of the definite changes of masses followed in the air and reflect the constantly changing conditions of temperature, pressure, humidity, and movement of the air at different levels above the earth's surface.

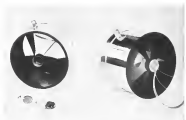
Data gained is expected to contribute significantly to accurate knowledge of the dynamics of weather. A simple but sophisticated gun will be in fitting in place in cloud observations over unattended land and ocean areas of the world. At present, less than 5% of the earth's atmosphere is covered by meteorological observation.

Tracking of troposphere weather systems in their clouds will make possible improved long and short range forecasts.

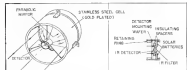
Later satellites with higher resolution reconnaissance equipment will make it possible to study the generation, growth and centers of hurricanes and immediate investigations of the long term weather balance will be conducted with climate changes and the relationship between solar phenomena and troposphere weather studied to learn the mechanism.



AT 300 mi. altitude Weather Eye could scan 1,280 sq. mi. but only about 640 sq. mi. along to left and right of satellite path would be used. From path comes area of 640 sq. mi. along line of orbit and 1000 mi. in horizon.



OPTICAL system are shown disassembled (left) and assembled (right). Mirror is mounted on lens, the eye. Disassembled parts are (1) to (5) reflecting ring, infrared detector mounted on mirror, spacers, holder for infrared films and four-axis detector, and spacers.



DRAWING shows optical system of Weather Eye equipment earth-based but not

is, which weather and climate are extremely complicated. Design of the weather reconnaissance lead to early boundary conditions beyond environmental boundaries such as sea, weight, shape, age and heat balance. Control of the electronic parameters have been set up under the Vanguard project by the Westhick radio tracking system.

These tracking systems have been laid out to create a "picture level" reception system so that a satellite, comes within range of at least one station during each revolution around the earth. The satellite is within range of the station for approximately one minute during which it must be interrogated by a coded signal down the ground station and transmit to the ground data path and stored on tape during the last revolution.

Readability available for the Weather Eye telemetry data is from 3.6 to 35 km. None level of the ground stations is defined as a 0.1 milliradian at 1,000 mi., yielding a signal to noise ratio of one.

Two detectors of the Weather Eye system are lead outside which means

that they will be sensitive from the upper edge of the visible spectrum out to about three microns. Focusing on cup on the detectors is two 8 D.P. optic system with 5 m. diameter apertures, weighing only 35 oz.

Tape Recorder

Signals from the two detectors amplified modulate a 280 cps subcarrier-beam, then two opposite polarities, one detector signal increases the subcarrier amplitude while the other decreases it. The composite signal is stored in a magnetic tape recorder that holds approximately 30 min. of data, about the amount of time it will take the satellite to pass over the midline of the earth.

To conserve batteries and tape time the tape recorder will be turned off while the satellite is on the dark side of the earth. This is done by using a signal from four solar batteries mounted around the infrared detector to provide a bias signal to the recorder motor which causes the tape to operate only when a reflected sunlight signal is present. Time control of the system is sufficiently long so that the recorder



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The spin axis will be horizontal (normal) with the respect to the earth's surface only at apogee and perigee.

Information as to the spin axis orientation is obtained by comparing the lengths of the pulsed laser and detector as they sweep across the earth from horizon to horizon. The length of the pulse indicating the amount of time that the detector was actually viewing the earth. But, because the orbit is elliptical, there will be periods during which only one detector will be viewing the earth. At these times, it will be necessary to compute the orientation on the basis of previously transmitted data.

The arrangement of the two detectors will keep at least one of them viewing the earth as the satellite spins about the elliptical orbit as long as it stays within 1,700 mi of the ground.

The true degree of eccentricity of the orbital system will resolve a 6 mi by 6 mi area permitting optimum resolution and the stability of 100 mi altitude with the spin axis being normal to the earth. As the angles of viewing and the altitudes change, this will determine and as a result not upper limit of 30 mi by 30 mi is reached. In one case, however, only that data coming from the 100 mi. lying to the left and right of the satellite path will be needed—generating a 500 mi wide enhanced strip map of the north side of the earth with each revolution.

Filter Center

► **Area Does Other Messes**—American North Area Corp. is expected to exploit its capability in the radio frequency and of the spectrum through acquisition of other services, regardless of outcome of present merger talks with Northern Aircraft Co. Likely candidates reportedly include Allen B. DuMont Laboratories and Thordane.

► **Minuteman Guidance**—North American's Autotronics Division, which was recent competitor for development of central guidance system for USAF's new Minuteman air-to-surface ballistic missile, has not yet decided whether to use its own digital computer or one developed by another company. *Aviation Week* (June 30, p. 15) had quoted that North American originally proposed to use computer developed by Litton.

► **RAMAC**, Gas Turbine & Piston-Driven Airplane Co. says it is first aircraft company to build new International Business Machines Corp. RAMAC (Random Access Method of Accounting and Control) which will be used to speed spare parts service to jet-

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Latest Aircoupe Embraces 258 Changes



POSITIVE stick action gets Aircoupe airborne. Note large windshields-canopy area.



COCKPIT and instrumentation of Aircoupe. Dual controls are standard equipment. Wheel console shows elevator and rudder, plus ground steering.



CONTINENTAL engine is easily accessible from ground, will tune be rated at 100 hp.

By Robert E. Sturfield

New York—Forney Aircraft's all-metal, open-cockpit Aircoupe F-1 embraces some 258 modifications over its predecessor, the Aircoupe, of which several thousand were built in Maryland by Engineering Research Corp., acquired by Forney in 1955.

Major among these are new nose and bottom cowls, heavier wing chord, wing, beveled tip, gear incorporating Belleville springs, plus interior with seat covered for 15G, bubble-type tinted windshield with non-flammable overhead canopy.

Model F-1 is produced at Forney's Ft. Collins, Colo., plant. Aircoupe features single control wheel, which alone coordinates ailerons, rudder and elevator, plus ground steering. Side foot pedal activates brake. Command gear tilts the crosswind factor out of takeoffs and landings.

For the beginner's transition to flight without rudder pedals should be quick and simple.

Performance factors evidenced during flight evaluation by AVIATION WEEK embraced:

- Takeoffs and landings. Wind is no problem. Aircoupe was crabbed into crosswind at 15 kt. on approach. General comment was made in crabbed position. Nose wheel immediately reversed in order to turn airplane straight down runway. During crosswind takeoff wheel alone held airplane in line. There are no flaps.

- Flight coordination. Aircoupe was held in gentle and steep turns at varying rates of speed. In turns only the forward rudder is activated. Control forces were light, and the tail remained centered throughout attitude changes.

- Safety in flight. Aircoupe has no tendency to spin, and a stall port begins on an increased rate of sink. At 7500 feet—2500 rpm—the airplane was pulled nose high until airspeed unit indicated 40 mph, then glided to 90 deg bank. There was no loss of altitude, no falling out. Power off, with ailerons exhibiting 95 mph, there was no heavy buffet, rather a nose-high settling down at 500 ft. per sec.

- Light, two-place Aircoupe is powered by a Continental C-90 125 engine generating 95 hp. at 2625 rpm. at 1600 ft. Some engine soon will be rated 100 hp. Forney's is serial MC-10451899CM71-52, dual patch. Dry weight of airplane is but 590 lb., gross is 1,400 lb. Useful load is 510 lb. Seating is side-by-side.



AIRCOUPE, with an aileron pedal, can be landed in crabbed attitude in crosswind. There are no flaps. Wing area is 142.5 sq. ft.

Nose and aileron ailerons is of all metal construction with flaps crating on aileron surfaces. Demonstrator had De-Glo markings on prop hub, tips and outside panel of control ailerons. All production models will have similar blower orange high-visibility markings unless otherwise specified by the customer. There is no additional cost involved.

Aircoupe air door to the ground on its travel gear, height to nose being but 5 ft. 6 in., making for easy access to engine. Gear track is 6 ft. 6 in. capers can be checked on fully-mounted cowling access door, without opening cowl.

Cowling was entered on uniform surface on wing. With two ailerons, seating was simple, and comfortable. Green nose fuselage rubber seat is solid carbon, like auto seat. Lack of aileron pedals suggests need for foot and air move about. Leg room is plentiful, and the three lower pedal being on pilot's side.

Crosswind: straps in composed of three aileron pedals, one of which is fitted to shock the top. Two sections above from the complete emergency. The forward section can be adjusted to convenience of pilots.

Dual control which are mounted on this airplane. Engine instruments are mounted to left of panel, flight instruments center. Throttle quadrant is located forward, center of main panel and very simple, handy and easy. Radio equipment included Norco Simplex VC-27, Omphreux VOA-2 and LIR-1.

Baggage compartment is located in cockpit just aft of seat and holds 25 lb. It will also take a 10-lb. seat. For

a child up to the same weight, in lieu of baggage. Overlooking the baggage compartment is large but shell and valve speaker. Master switch a microphone located on top of fuel tank. Forney can relocate the switch forward of pilot on instrument panel.

Each wing tank holds 9 gal. of fuel. The nose fueling tank holds 6 gal. 7 gal. is ground fueling system to nose tank, where it is given fuel to engine. Cockpit fuel gauge mounted on low side of fuselage to left of pilot, shows capacity of wing tanks also. Nose tank, accor-

position fueling gauge on top of fueling. Indicator, at instrument extension shows 1 lb. supply, good safety margin in event of fuel pump failure which would affect wing tanks.

Wing tank shut-off valve is located under and forward of instrument panel on right side of fuselage and does not obstruct flow from nose tank. In order to prevent, forward of pilot's seat a fuel shut-off valve which restricts supply from all tanks.

Engine started quickly, and airplane was loaded out for run up. Tuning was smooth, and Aircoupe revealed with a control wheel was turned left or right.

Demonstrator flew on N7110C. Its weight with instrumentation was 602 lb. With two ailerons, plus 150 lb. of gear and fuel and 60 lb. of baggage, airplane grossed over 1,500 lb. Best fuel pressure was 29.67 in. (1065.1 psi). Wind was from the west at 15 kt. Outside air temperature was 61°F.

Before taking the controls I had to make sure legs in good tracking. The under panel that wouldn't be there. We had a 45 deg crosswind and 60 mph tail wind, plus 1000 ft. wind. With full throttle, airplane was stressed down corner like a car. Weathercocking a cross effect by steering. Upward wing came up some, but airplane, because of negative wing angle was still holding ground at 70 mph until wheel was pulled back sharply and airplane lifted off after about 700 ft.

Initial climb was made at 80 mph. Nose was lowered slightly for better forward visibility, and at 90 mph. Aircoupe went up at 900 ft. Airplane was leveled off at 4000 ft. and rudder slightly lowered out. At this

BUSINESS FLYING

Aircoupe F-1

Specifications	
Empty weight	590 lb.
Gross weight	1,400 lb.
Useful load	510 lb.
Wing area	142.5 sq. ft.
Wing span	39 ft.
Length	22 ft. 3 in.
Height (nose)	5 ft. 6 in.
Height (tail)	5 ft. 3 in.
Power loading	15.5 hp./sq. ft.
Wing loading	9.5 lb./sq. ft.
Baggage capacity	25 lb.
Fuel capacity	24 gal.
Performance	
Range	340 mi.
Fuel consumption (75% power)	5.6 gph.
Absolute ceiling	15,000 ft.
Service ceiling	10,000 ft.
Max. cruise (75% power)	123 mph/3,45
Stall speed	56 mph/31A
Takeoff distance (sea level)	500 ft.
Landing roll (sea level)	400 ft.

SPECIFICATION: Stainless Steel Honeycomb "Sandwich"

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altitude, pulling 75% power—1,500 rpm—approach indicated 115 mph on low-fly heading engine, low true air speed of 132 mph. Outside air temperature was 49°. Approach a mile and a half high.

Cross-country flight was at 2 to 40 miles duration. Fuel consumption averaged 5.5 gph. Flight was comfortable and we didn't have to raise our noses to converse. With big windshield area and bubble-type canopy, visibility was excellent. One can look directly behind in this airplane.

Flight Characteristics

Aircraft is quite maneuverable and stable, with an adjustable character when appropriate. Throughout unusual flight attitudes and low speeds. Still produce little buffet and no bank, rather a nose-high rock which can be adjusted with addition of power.

With engine turning 1,500 rpm, Aeronca was flown at 75 mph, during bank and turn. Control and advisory cockpit coordination were excellent, wheel alone does the trick very easily. In extreme nose-high attitude power will, airplane did bank down and roll rate increased to 1,000 rpm. Holding 45 mph there was no buffet, just a steady sink at 500 rpm.

It wasn't until several landings were made that I began to feel at home without rubber pads. Because of great speed, approach was made at 80 mph, indicated speed and rpm at 1,500. Rate of descent was 500 fpm. (Normal approach rates from 40-70 mph).

With constant engine rpm indicated approach and landed in this attitude. Here was where I missed the rubber pads. But in every instance touch-down was made at about 35 mph in critical position, airplane's wheel was engaged, wheel in contact to take Aeronca straight down the runway.

Normal takeoff got us off the ground in less than 180 ft. on about 17 sec., again with decrease pull of wheel. Airplane can get in and out of tight spots, but it won't stall out a little rank, after reaching flying speed, will do the trick.

Short-field takeoff was made by holding wheel back at start of roll. In this manner airplane was flown off at 95 mph, in slightly over 500 ft. Holding 70 mph on approach and 60 mph over the field, Aeronca was landed and stopped in less than 300 ft.

Businessman Market

Checking out on the Aeronca one has a quick picture, and there is one who the airplane is the businessman who wants to learn to fly in a home. Companies delivered 51 Aeroncas by July 1 and expects to produce a total of between 180 and 200 this year. De-

livered to date have been designed as a stability of engine.

Basic price of the airplane is \$6,995. Standard equipment includes dual fuel tanks, winged indicator sensitive altimeter, tachometer, rate of climb, turn and bank, oil pressure and temperature gauges, ignition and instrument lights, three-point harness, heated overhead sun shade, air vents, cabin heater, heated windshield, foam rubber seat, no-draw ramp.

Start search fly area with 5800-980 watts of optional equipment, marine radio navigational. Optional equipment offered includes "Lulu" seat, wing landing lights, artificial horizon, dual hand gauges, fuel and oil pressure indicators, hand temperature and outside air temperature, clock, anti-collision light, navigation light flasher, cabin heater, and Morse VC-27 Simplex, VOA-2 Gyrocompass and Superhomer. Prices exclude direct bank operating cost to be \$1.14, based on following:

- Gas and oil—5.6 gph at 154 psi and oil at .406 psi qt., including 25 lb. oil change—\$1.12
- Inspection and maintenance—\$7 and 100 lb. inspection, parts and second maintenance—\$12.
- Reserve for engine overhaul—approximately \$500 at interval—50%.

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Army YH-40 maneuvers during CAA finalization demonstration by Bell Helicopter Corp. as first step toward entry into conventional turbine helicopter market. Engine as test item here has been changed from XU-40 configuration and cabin has been lengthened.

Civil Market Seen for Bell Turbine Helicopter



Developed over civilian YH-40 cabin assembly (left) to start of final assembly line. Workers (right) adjust engine section wiring.



Time YH-40s are in progress construction stages on Bell final assembly line. Six will be delivered to Army.

Bell HU-1 turbine helicopters will come off production line this fall and will be the company's entry in the conventional turbine helicopter sales market. Army YH-40, a rescue and transport helicopter used by Civil Aeronautics Administration finalization demonstration (AW Aug. 4, p. 16). Conventional version, designated Model 184, carries six persons, has a three-stage of more than 500 hp and cruise speed of 133 mph. Bell is not yet ready to take commercial action although CAA certification is first step toward the market. Henry Corbett, Bell president, said the Model 184 will be made available for commercial delivery as soon as military production permits. High output is provided by Lycoming T55 gas turbine engine which, on the YH-40, has been devoted to 770 shp. The engine is currently undergoing CAA certification tests at Westfield, Conn.

T55 engine and flight controls are installed in this YH-40. Inlets on top of cabin are for cabin air, new custom UHF and VHF antennas.



Turbine engine is used at 500 shp; has been devoted to 770 shp on YH-40 model.

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French Start New Helicopter Services

Paris—Two private companies have started limited commercial helicopter operations in France. Newsweekly Aéro has Cn-4 surface bus transportation firm—operating a Vertol V-44 between Caen and Le Havre, making three flights daily with stops at Normandy beach resorts. V-44 has been leased from Helicopt-Air, Vertol's representative in France.

In the Paris area, Aérostar is doing a bus service between Orly and Le Bourget Airports using a Sud Aviation Alouette turbine-powered helicopter on an unscheduled basis. Trip between the two fields costs \$11.

PRIVATE LINES

See Kawasaki-Bell B-47 helicopter will be shipped to Russia under a \$150,000 repatriation contract, with Russian bearing cost of Japanese ported engines and other equipment, and taking under repatriation agreement. Deliveries are contracted to begin in September.

Delivery of a Cessna 296 executive transport to Mid South Airlines under initial transaction under new long-term lease and lease-purchase program developed by William C. Wood, New York, aircraft broker. Plan provides for Wood to handle sale of customer's inventory equipment and credit all or portion of this to lease of new aircraft. Contract with Bell Aircraft calls for five-year lease and added five-year extension.

Tandem A-2 agricultural plane received Type Certificate 4520 from Civil Aeronautics Administration. Plane powered by a 600 hp. Pratt & Whitney (R-1140) engine and is designed to carry 2,000 lb. of low-dust solids or 3,000 lb. of higher specific gravity chemicals in its 55 cu ft hopper. Production of the A-2 planned in single and two plane versions with open and closed cockpit.

Fairchild F-27 completed 20th accelerated flight test program for CAA in five days despite poor weather during period. Routes have simulated local service flights, and a morning flight was made from Hagerston, Md., to New Orleans, La.

Order for some 30 Japanese-built Top LH-1140s, Beech T-34 Minotaur under license, is expected to be placed by Indonesian. With contract expected to provide for 10-yr. maintenance plus purchase.



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Please write to: Mr. A. E. Stevenson, Engineering Personnel, North American Aviation, Los Angeles 43, California.

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Light De-Icer

Initial tests of new Goodrich lightweight de-icing system for small twin business planes is examined on tail of Piper Apache by Joseph Yarnoff, president, Wingfoot Development Co., Mansfield, Conn., which installed prototype system on its own airplane. Similar tests cover entire leading edges of wings. System weighs only 50 lb. installed, without air compressor in 4-in. H. Polypropylene sphere to activate boots (AVR Test 23, p. 75). Sufficient compressed air can be stored to operate up to six hours of de-icing if boots are actuated once every 30 seconds.

USAF Contracts

Following is a list of authorized contracts for \$17,500 and over as released by U.S. Air Force contracting officer:

- NOVA AIRCRAFT, AUSTIN, TEXAS: \$100,000.** General Services, Texas, Order 1-67 studies and development of technical data analysis system and other items (para. 10) from March 2, 1967 (143) award AF 61-1000 (143) \$100,000.
- PHOTO-AUTOMATIC, CHICAGO, ILL.: \$100,000.** General Services, Texas, Order 1-67 studies and development of technical data analysis system and other items (para. 10) from March 2, 1967 (143) award AF 61-1000 (143) \$100,000.
- WESTERN MILITARY PRODUCTS CORP., CHICAGO, ILL.: \$100,000.** General Services, Texas, Order 1-67 studies and development of technical data analysis system and other items (para. 10) from March 2, 1967 (143) award AF 61-1000 (143) \$100,000.
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Mr. Edmond Coleman, President Bonanza Air Lines

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The story doesn't end here though—not if your airline wants these same 'feature-rich' TECO benefits! Write for free TECO Coronado 600 airline seat information and the latest on TECO's production-available Energy Absorption—for the 600 series too!



Looking further ahead—The First Airlines from the 'TECO' fleet! They like TECO's air seat mechanism design advanced safety and low life cycle cost with low cost long service life.

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Convair 240, 340 and 440 modifications include airframe, engine and system improvements for greater reliability and better performance (the



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Charles H. Whiting, General Counsel,
Frost, Van Nostrand, LLP, comments on bank
regulation and risk. E-mail: cwhiting@fvt.com

Westinghouse Electric Corp., 1000, 1990

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项目	2017年	2016年	2015年
营业收入	10,000,000	9,500,000	9,000,000
营业成本	6,000,000	5,800,000	5,500,000
营业利润	4,000,000	3,700,000	3,500,000
利润总额	4,200,000	3,900,000	3,700,000
净利润	3,150,000	2,925,000	2,775,000

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Chain Refueling

U.S. Navy North American FJ4B (top) with a McDonnell F3H 2N which is two years older; a Douglas A4D 2, which similarly serves as the A4D 2. Unusual refueling maneuvers are performed over Edinburg, Mo.

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During the last 4 months of 1957, when 30% of the engines in use first of 11 companies were diesel-electric, average operating time increased to 104.5 hours, with 78.9% utilization. This time is expected to increase as other engines become exclusively diesel-electric.

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CORROSION RESISTANCE... New "no-mag" cable has corrosion-resistant qualities similar to, but slightly better than, cables made of standard stainless steel.

GOOD THERMAL CHARACTERISTICS... The thermal expansion characteristics of new "no-mag" cable are much closer than those of standard stainless steel or carbon steel cables.

to the characteristics of stainless alloys used in aircraft. This greatly simplifies manufacturing cable tension and various changes in temperature.

HIGH FATIGUE RESISTANCE... Preferred construction and careful processing give new "no-mag" cable high fatigue resistance.

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TENSILE STRENGTH, while lower than that of stainless and carbon steel, is sufficient to enable replacing them, due for use, with "no-mag" on many applications where the characteristic of "no-mag" are required.

USE WITH SWAGED TERMINALS... Swaged terminals can be applied to standard or dimension.

COMPLETE RANGE OF SIZES, CONSTRUCTIONS... New "no-mag" is furnished in sizes from 1/16" to 1" in all of the standard aircraft cable constructions.

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304. High speed motor drive AP 110-14, 1 p. 10, 10 p. 11.
Peters, Kenneth, McCarty & O'Brien, Los Angeles 44, aircraft engine air-frames. The evolution of the first operating model of a new engine. Later that is to be used for aircraft engine. In the 1970's, the engine is to be used. 10 p. 11, 10 p. 12.
Sellers, R. W. 10 p. 11, Los Angeles 44, in engine and design engine and improvements in 1970-1971. 10 p. 11, 10 p. 12.
R. E. Sellers, Los Angeles 44, modify engine and design engine and improvements in 1970-1971. 10 p. 11, 10 p. 12.
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WHAT'S NEW

Reports Available:

The following reports may be obtained from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.
Aircraft Collision-Avoidance System Requirements—by P. J. L. Ruchelle and R. E. Bowers of Naval Research Laboratory. \$1.75, 4pp. (PB 131592)

Some Aspects of Crystal Performance in a New Microwave Rectifier—by G. E. Harkness, Texas Signal Laboratory for Signal Corps Engineering Laboratories. U. S. Army. \$1.00, 5pp. (PB 131515)

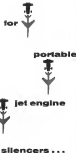
Automatic Data Reduction System—Amplitude—Disturbance and Correlation Analysis—by A. Shapiro, Naval Research Laboratory. \$3.75, 11pp. (PB 131595)

The Analog Accelerometer—W. A. Van Veld, Jr., Naval Research Laboratory. \$5.75, 11pp. (PB 131531)

Summary of Development and Evaluation of Insulating Type Rectifier Contacts—by S. Shure, C. A. Hunk, and A. V. Levy, Massachusetts Aircraft Co. for Wright Air Development Center. U. S. Air Force. \$5.75, 9pp. (PB 131750)

Comarc Random Access and Pinned Contacts—by M. T. Green and others of the New York State College of Aeronautics for Wright Air Development Center. U. S. Air Force. \$5.75, 4pp. (PB 131168)

Factor Controlling Resistance to Deformation and Mechanical Failure in Polycrystalline (Copper) Contacts—by J. E. Williams, Jr., and L. E. Murrell, National Bureau of Standards for Wright Air Development Center. U. S. Air Force. \$2.00, 75 pp. (PB 131622)



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Preliminary Microscopic Studies of Contacts at High Temperatures—by E. T. Manganaro, T. S. Shultz, R. M. Gorenbaum and H. W. Newkirk, the Office State University Research Foundation for Wright Air Development Center. U. S. Air Force. \$1.25, 46pp. (PB 131470)

Effects of Temperature-Time-Stress Relations on the Mechanical Properties of Aircraft Structural Metallic Materials—Part I—Temperature-Time Studies for 1624-T3 and 7075-T3 Alclad Sheets—by R. E. Farney and C. H. Auer, Natick Arsenal, for Wright Air Development Center. U. S. Air Force. \$5.75, 24pp. (PB 131520)

Integrated Instruments A Bell and Tapp Indicator—by R. E. Tapp, Jr., and M. L. Ruchelle, University of Illinois for Wright Air Development Center. U. S. Air Force. \$7.75, 21pp. (PB 131439)

High Velocity Air Filter—by T. E. Wright, R. J. Stoney and C. E. Lipp, Davidson Co., Inc. for Wright Air Development Center. U. S. Air Force. \$6.00, 27pp. (PB 131579)

Study of Explosions and Fire Suppression of Aircraft Engine Section—by C. Griffin, W. Gaskill and C. Yaff, Southwest Research Institute for Wright Air Development Center. U. S. Air Force. \$2.25, 10pp. (PB 131499)

A Design Study of an Aircraft Cargo-Handling System—by Douglas Aircraft Co., Inc. for Wright Air Development Center. U. S. Air Force. \$2.50, 10pp. (PB 131590)

Cold Weather Operation of Diesel Engines—A. E. Harkness—Part 2—by M. W. Adams, J. E. Shum and C. H. Brown, Technical Information Division, 11 hours of Congress for Office of Naval Research. \$3.75, 150pp. (PB 131442)

Equipment for Mobile Logistics Support—by U. S. Navy Supply Research and Development Center. \$2.25, 9pp. (PB 131679)

Artificial Earth Satellite—by Y. A. Pukhovskiy, 23pp. monograph which appeared as an index to a larger Russian publication "Monthly Space Travel" Feb. 1957. \$7.75 (PB 131764)

High Temperature Hydraulic Fluid Development Status and Engineering Data—by G. Hunk, and R. J. Brown, Wright Air Development Center. U. S. Air Force. \$4.25, 43pp. (PB 131522)

Organic Compounds of Gallium-A Summary of the Literature—by A. J.

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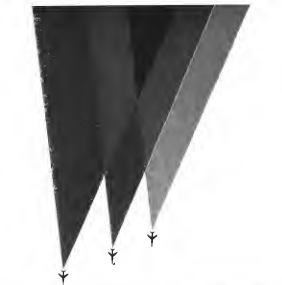
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Outline of products, facilities and customer service, booklet, *Melroe Aircraft Instrument Corp.*, 185 Binger St., Wood Ridge, N. J. — Describes, discusses and performance charts of a.c. and d.c. sensitive instrument devices, catalog, *Globe Industries, Inc.*, 1765 Stanley Ave., Dayton 4, Ohio. Illustrated brochure describes hand tools and accessories for gasketing, torquing and gaging head rivets and lockbolts, *Hink Manufacturing Co.*, 2658 Bellevue Ave., Detroit 7, Mich.

Photo-illustrated description of high-flow liquid/gasous oxygen facility available for mobile component tests (Oxide Laboratories), new hydrogen facility, *Waco, Calif.*, *Bellchem No. 3, Waco Associates*, 123 Bellmead St., El Segundo, Calif. — Illustrated brochure of available standard and non-standard types of shock tests for atomic, electronic and electrical equipment industries, *Design Manual 5867, Electric Shop Not Corporation of America*, 2533 Vauxhall Rd., Union, N. J.

Automatic Welding Wire Pocket Guide presents facts of wire types, wire diameters, packaging data, stock and information, etc., *Iron-ADC 571, Air Reduction Sales Co.*, division of Air Reduction Co., Inc., 150 East 42nd St., New York 17, N. Y. — Photographs and descriptions of company's comprehensive activities, facilities and personnel, *Customer Relations Department, Aeromarine Development Corp.*, P. O. Box 689, Santa Barbara, Calif.

Listing of more than 100 new items of mechanical and electronic hardware, and description of facilities for custom design and manufacture, *Catalog No. 23, Lewis Electronics, Inc.*, 565 South Varsity St., Berkeley, Calif. — Operating data, specifications and performance curves of 1-Mc rotary position indicator blocks and electronic devices, *Meridia Design Division*, 190 Fourth St., Racine, Wis.

High Speed Zener Switching Circuit, application bulletin Vol. 1, No. 4, is a detailed information on high speed electronic switching for switch, comparison and ground control comparison, *Editor, Application Notes, Motorola Electronics Corp.*, Semiconductor Division, 550 Fifth Ave., Evanston, Ill. — Description of design and operating data on *Scramascope*, *Bullitt 100, Russell Instrument Co.*, 5545 Elm Ave., Los Alam, Calif.

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X This is the result of a series of experiments dealing with heat treatments in a dry state. Though much of the information is elementary, it is better to be correct in using in this field, including some of the basic experience that may find it useful to derive fundamentals from time to time.

Chromium and Its Effects in Alloy Steels

As previously pointed out in this series, the elements that together make up an alloy steel work both singly and collectively. In a sense they are like the components of a machine, each having its job to do, yet each working with other components to achieve an overall result.

An earlier discussion was devoted to the functions of nickel in this one we shall outline briefly some of the purposes of chromium, another of the fundamental alloying elements.

Chromium is a versatile agent. Among other things, it fosters depth hardenability, improves surface resistance to abrasion and wear, and promotes carburization. Of the common alloying elements, chromium ranks near the top in hardenability. This property tends to make high-chromium steels relatively air-hardening; hence it is valuable in applications where, for one reason or another, liquid quenches are undesirable.

Chromium steels are relatively stable at high temperatures and are often used where resistance to heat is important. Moreover, the presence of chromium is a vital factor in helping to retard or prevent corrosion.

The uses of chromium steels are many and varied. Among the more

familiar items that often contain chromium are hand tools, gears, springs, turbine wheels, ball and roller bearings, forged shafts and rotors, etc. There are of course numerous others; virtually no list would be all-inclusive.

One of the most useful of the alloys, chromium has been the subject of long study by Bethlehem metallurgists. These technicians have a thorough working knowledge of its effects in various types of analyses. Whenever you have a problem involving chromium steels, or would like to know more about the subject in general, by all means communicate with the Bethlehem staff. Our men will come to your office or plant at any time. You will find them co-operative and helpful.

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large, involved than had Capt. Haynes and his group had less than 100-100 ft. in the high-altitude approach during training. He certainly would have been worried about it. The third that the company thought the maneuver as it was to be executed and developed structure where it could be applicable, indicated that while limits to the approach technique were probably not precisely stated, the structure of the aircraft and rate of descent should be the manner in which it should prompt the pilot to go beyond the technique. The Chief of Training and that thereafter, some time would not another result intended to it, a decision had been made to publish within mutual training points against a completely general approach. This method he said would not act as applicable to the operation of the Martin 404 but to all of the center equipment fit and the material would become part of the flight manual for each type aircraft. It is clearly evident that the proposed change to V-404 on the basis of high level was reduced by reducing the number of an emergency descent scenario. It is equally clear that this item would the design strength of the aircraft structure. Other damage occurred as the impact of events when the aircraft ground and contacted the various personnel, and when the propeller cut and tore the air craft structure.

The second scenario with Capt. Haynes that the technique be employed after taking control from the first officer was fairly well presented the last finding. In an interview of his experience and capabilities he should have related that a small aircraft, carrier aircraft, should be that normal and an aircraft high rate of descent would result from the technique. Knowledge of an approach maneuver 10 ft. and 15 ft. or so, of power should have indicated to him that the approach would have been the technique, would be an desirable in structure or carrier position. Further, if Capt. Haynes did not know precisely the approach would result from this technique it was wrong to use it.

It is also the Board's view that company training did not deal in such a rigorous manner. The Board notes that a training program cannot adequately not cover every possible maneuver or situation. Nevertheless, it is a view to determine the side operational needs of maneuvers such as the training approach. In this situation, where the limits of approach and power maneuver, an aircraft would not be able to fly in the high-altitude approach. The program involved which indicated under such operational circumstances together with this one would serve to emphasize the approach and reduce for each scenario. The scenario added to the flight manual concerning points against a completely general approach appears to be essential under the circumstances.

FINDINGS

On the basis of all available evidence the Board finds that:

1. The carrier, the aircraft, and the flight crew were properly evaluated.
2. The flight was properly depicted.

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WHATEVER YOUR FIELD,

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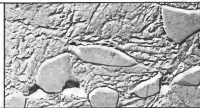
Advanced nature of work typified by alloy investigation illustrated below

An indication of the way research and development at Republic opens up potential in the entire field of engineering and scientific endeavor is this partial list of current programs: investigation of magnetohydrodynamics, exotic structures

and materials, nuclear applications to flight... development of new concepts in large-scale aircraft, rocket engines, missiles, new procedures and instruments to improve flight-test results, aircraft, satellites and space vehicles.

HOW CAN BEST TESTMENT BE GIVEN BY ANYONE BUT YOU?

Our answer is supported by this 10,000 X electron micrograph showing penetration flow through porous metal. It is a direct result of our research and development work in the field of porous metal.



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► FLIGHT TEST

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*Allison Prop-Jet-Powered Lockheed Electras
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Everything is big "down under," including the growth rate of the national economies. And all four airlines in Australia and New Zealand — Ansett/ANA, TAA, Qantas and TEAL — are staying in the forefront of national progress. They've *all* ordered Allison Prop-Jet-powered Lockheed Electras equipped with Aeroproducts propellers, the fastest, most modern, most efficient prop-jet-powered airliners ever flown.

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